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District of Sudbury

by
M.W. Carter

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FOREWORD

The Shining Tree Area contains numerous occurrences of gold, copper, cobalt, molybdenum, nickel and silver. In 1971 only partial geologic map coverage was available for this region, the most recent consisting of reconnaissance level information recorded in 1931. A series of detailed mapping projects was initiated to provide a more effective basis for determining the region's mineral potential and for guiding exploration. The Cabot-Kelvin Townships survey presented in this report is the fifth of this series.

V.G. Milne
Director
Ontario Geological Survey

CONTENTS

Abstract 2
Introduction 4
Location and Access 4
Physiography 4
Previous Geological Work 4
Present Geological Work 4
Acknowledgments 5
General Geology 6
Table of Lithologic Units 7
Early Precambrian (Archean) 6
Metavolcanics 6
Ultramafic Metavolcanics 6
Ultramafic Komatiite 10
Basaltic Komatiite 11
Carbonatized Ultramafics 12
Mafic Metavolcanics 12
Flows 12
Pyroclastic Rocks 16
Intermediate Metavolcanics 16
Flows 16
Pyroclastic Rocks 20
Felsic Metavolcanics 20
Flows 20
Pyroclastic Rocks 21
Metavolcanics and Metasediments 25
Metamorphosed Mafic and Ultramafic Intrusive Rocks 25
Felsic Intrusive Rocks 27
The Togo Batholith 27
The Claw Lake Stock 29
Early Precambrian (Archean) to Late Precambrian (Proterozoic) 31
Mafic Intrusive Rocks 31
Tholeiitic Diabase Dikes 31
Alkalic Diabase Dikes 33
Cenozoic 34
Quaternary 34
Pleistocene and Recent 34
Structural Geology 35
Folding 35
Faulting 35
Correlation of Geology and Geophysics 36
Economic Geology 37
History of Exploration 37
Character of the Deposits 38
Quartz Monzonite-Granodiorite-Copper-Molybdenum Sulphide Association 38
Native Silver-Cobalt-Nickel Arsenide Ores ("Cobalt" Type) 38
Stratiform Sulphides of Marine and Marine-Volcanic Association 38
Chalcopyrite-Magnetite Gabbro Mineralization 38
Description of Properties, Deposits, and Explored Areas 38
Cabot Township 38
1. Canadian Johns-Manville Company Limited 38
2. Claw Lake Molybdenum Mines Limited 40
3. Doyon, P. 41
4. Falconbridge Nickel Mines Limited 41
5. Galata Occurrence 42
6. Irving, M.A., Estate 42
7. Johnsmith Mines Limited 42
Central Area 43
East Central Area 44

Southeastern Area 44
8. Larche, J.P. 44
Kelvin Township 45
9. HBOG Mining Limited 45
10. Talisman Mines Limited 46
Recommendations for Future Mineral Exploration 47
References 48
Index 49

TABLES

1 Table of Lithologic Units 7
2 Chemical analysis (weight percent) and specific gravity of a selected altered ultramafic rock 8
3 Molecular norm, normative plagioclase composition and molecular colour index of a selected altered ultramafic rock 8
4 Chemical analysis (weight percent) and specific gravity of selected subalkalic mafic metavolcanic rocks 14
5 Molecular norm, molecular colour index and normative plagioclase composition of selected subalkalic mafic metavolcanic rocks 15
6 Chemical analysis (weight percent) and specific gravity of selected subalkalic intermediate metavolcanic rocks 17
7 Molecular norm, molecular colour index and normative plagioclase composition of selected subalkalic intermediate metavolcanic rocks 18
8 Chemical analysis (weight percent) and specific gravity of selected subalkalic felsic metavolcanic rocks 22
9 Molecular norm, molecular colour index and normative plagioclase composition of selected subalkalic felsic metavolcanic rocks 22
10 Chemical analysis (weight percent) and specific gravity of selected mafic intrusive rocks 24
11 Molecular norm, molecular colour index and normative plagioclase composition of selected mafic intrusive rocks 24
12 Modal percentages of minerals in selected granitic rocks 28
13 Chemical analysis (weight percent) and specific gravity of selected granitic rocks from the Claw Lake Stock 29
14 Molecular norm, molecular colour index and normative plagioclase composition of selected granitic rocks from the Claw Lake Stock 30
15 Chemical analysis (weight percent) and specific gravity of selected mafic intrusive rocks (diabase dikes) 32
16 Molecular norm, molecular colour index and normative plagioclase composition of selected mafic intrusive rocks (diabase dikes) 32

FIGURES

1 Key map showing location of Cabot and Kelvin Townships 2
2 Alkalies-silica plots of selected metavolcanic rocks 9
3 Ol'-Ne'-Q' projections of selected metavolcanic rocks 9
4 AFM plots of selected metavolcanic rocks 10
5 Al_2O_3 weight percent normative plagioclase composition plots of selected mafic metavolcanic rocks 11
6 Normative colour index-normative plagioclase composition plots of metavolcanic rocks 12

PHOTOGRAPHS

1 Photomicrograph of ultramafic komatiite 13
2 Photomicrograph of aphanitic andesite 19
3 Photomicrograph of aphanitic dacite 19
4 Photomicrograph of andesitic tuff 21
5 Photomicrograph of porphyritic rhyolite 23
6 Photomicrograph of porphyritic rhyolite 23
7 Photomicrograph of tholeiitic metagabbro 26
8 Photomicrograph of olivine gabbro 27

GEOLOGICAL MAP (BACK POCKET)

Map 2470 (coloured)—Cabot and Kelvin Townships, District of Sudbury. Scale 1:31 680 (1 inch to 1/2 mile).

CONVERSION FACTORS FOR MEASUREMENTS IN ONTARIO GEOLOGICAL SURVEY PUBLICATIONS

If the reader wishes to convert imperial units to SI (metric) units or SI units to imperial units the following multipliers should be used:

CONVERSION FROM SI TO IMPERIAL			CONVERSION FROM IMPERIAL TO SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
			LENGTH		
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709 7	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
			AREA		
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
			VOLUME		
1 cm^3	0.061 02	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.308 0	cubic yards	1 cubic yard	0.764 555	m^3
			CAPACITY		
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
			MASS		
1 g	0.035 273 96	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 75	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 62	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 908 8**	t
			CONCENTRATION		
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

1 ounce (troy)/ton (short)	20.0	pennyweights/ton (short)
1 pennyweight/ton (short)	0.05	ounce (troy)/ton (short)

NOTE–Conversion factors which are in boid type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries published by The Mining Association of Canada in co-operation with the Coal Association of Canada.

Geology of Cabot and Kelvin Townships District of Sudbury

by
M.W. Carter[1]

[1]Geologist, Ontario Geological Survey, Toronto.

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ABSTRACT

This report describes the geology and mineral occurrences in Cabot and Kelvin Townships, centred about 29 km (18 miles) east-northeast of Gogama Village, in the District of Sudbury. The townships cover an area of about 186 km^2 (72 square miles).

All consolidated rocks in the map area are of Precambrian age. These are covered by a mantle of Cenozoic deposits of Pleistocene and Recent age.

Precambrian rocks of Early Precambrian (Archean) age comprise a metavolcanic-metasedimentary sequence interlayered with mafic intrusive rocks, which are cut by felsic intrusive rocks comprising the Togo Batholith and the Claw Lake Stock. All the rocks are cut by Early Precambrian (Archean) to Late Precambrian (Proterozoic) diabase dikes of at least two different ages. The metavolcanic rocks consist mainly of mafic tholeiitic and calcalkalic flows in the lower part of the sequence, and calcalkalic intermediate pyroclastic rocks in the upper part of the sequence. Minor amounts of felsic flows and pyroclastic rocks occur in both sequences. Komatiitic metavolcanics are subordinate, and occur in the upper part of the sequence in eastern Kelvin Township. Felsic intrusive rocks of the Togo Batholith comprise a porphyritic quartz-rich hornblende-biotite granodiorite and the Claw Lake Stock consists predominantly of a dark, grey-green quartz diorite with a marginal phase of quartz diorite porphyry. The diabase dikes comprise a northwesterly to northeasterly set of tholeiitic diabase, which is cut by an east-northeasterly alkalic diabase set.

Cenozoic units are comprised of sand and gravel deposits best developed in the northern third of Cabot Township and the northwestern corner of Kelvin Township. The sand and gravel deposits form eskers and the sand deposits form sand dunes convex to the east-southeast in the northeastern part of Cabot Township.

Structurally the metavolcanic-metasedimentary rocks form the northwestern limb of a synclinorium in the western two-thirds of the map area, and the central part of the same synclinorium in the eastern third of the map area. The axis of this synclinorium is interpreted to plunge east-northeastwards. The rocks in the western two-thirds of the map area dip predominantly south-southeastwards and strike east-northeasterly. Three major north-northwesterly trending faults cross the map

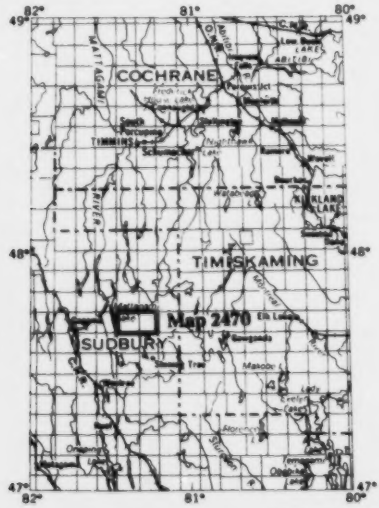

Figure 1. *Key map showing the location of Cabot and Kelvin Townships. Scale 1:3 168 000 (1 inch to 50 miles).*

area, which are, from west to east: the Ketchiwaboose Lake Fault, the Kelvin Lake Fault, and the Grassy Lake Fault. These are believed to be gravity faults.

Mineralization in the map area is of four types: (1) the porphyry copper-molybdenum type, (2) the native silver-cobalt-nickel arsenide "Cobalt" type, (3) the stratiform volcanogenic sulphide type, and (4) the copper-magnetite gabbro type. The porphyry copper-molybdenum type occurs in the Claw Lake Stock in southern Cabot Township, the native silver-cobalt-nickel arsenide type is associated with diabase dikes and the copper-magnetite gabbro type occurs in central Cabot Township. the volcanogenic massive-sulphide type of mineralization occurs in central Cabot and eastern Kelvin Townships.

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INTRODUCTION

Location and Access

The Townships of Cabot and Kelvin cover an area of about 186 km^2 and are centred about 29 km east-northeast of the village of Gogama in the District of Sudbury. The map area is bounded approximately by Longitudes 80°12′ and 81°27′30″W, and Latitudes 47°40′ and 47°45′30″ N.

Access is good for the eastern half of Kelvin Township and the northern half of Cabot Township as these areas are traversed by a dry-weather gravel road connecting Highway 560 and Mattagami Lake in Togo Township, immediately west of Cabot Township. The western part of Cabot Township can be reached by the road serving the Hydro Electric Power Commission transmission line, but the southeastern part of the township, and the southwestern part of Kelvin Township are best reached by float-equipped, fixed-wing aircraft, using Claw Lake and Okawakenda Lakes respectively.

Physiography

The map area has low relief, the maximum elevation difference being 46 m. The northern half of Cabot Township is topographically a gently undulating sand plain which forms part of an esker complex on which sand dunes, convex southwards, occur. The area of maximum relief occurs in southwestern Kelvin Township where the steepest ridges occur in terrain underlain by volcanic rocks.

Drainage is southerly and westerly for the western two-thirds of the area, and is carried by Claw Creek and its tributaries, which drain into Mattagami Lake immediately west of the map area. Kelvin Creek and Marne Creek drain the northern part of Kelvin Township and this drainage is northwards. The drainage in southeastern Kelvin Township is southwards by way of Bigfour Creek and Michiwakenda Lake.

Previous Geological Work

Geological investigations in the area began in 1899 when W.A. Parks (1900) examined parts of the Districts of Algoma and Nipissing, including the areas occupied by the Townships of Cabot and Kelvin, and prepared a geological map at a scale of 1 inch to 8 miles. In the next year, 1900, A.P. Coleman (1901) apparently traversed the southern part of Cabot Township on his way to Shining Tree Lake. In 1925 F.L. Finley (Gledhill 1926) carried out a geological survey of Cabot and Kelvin Townships during his mapping of the Townships of Burrows, Kemp, Mond, Cabot, Kelvin and Natal at a scale of 1 inch to 1.5 miles. This was followed by the mapping of the southern halves of both Cabot and Kelvin Townships by H.C. Laird in 1933 (Laird 1934) at a scale of 1 inch to 1 mile. This was the last geological mapping of the area before the current survey.

Present Geological Work

Field work for this project was carried out during the summer of 1975 using vertical aerial photographs at a scale of 1:15 840 supplied by the Ontario Division of Forests. Pace-and-compass traverses were run at intervals of about 400 m to investigate pre-located outcrop areas observed on the photographs, or across areas of potential rock exposure. The traverses were run at right angles to the strike wherever the latter could be determined. Shoreline exposures were examined using canoe access and were studied in greater detail.

Geological data were recorded directly onto acetate sheets attached to the aerial photographs carried on traverse. These data were then transferred to 1:15 840 cronaflex base maps compiled by the Cartography Section of the Ontario Division of Lands. The cronaflex base maps were derived from the Forest Resources Inventory maps of the Silviculture Section of the Ontario Division of Forests.

Two preliminary, uncoloured, geological maps, P.1104 for Cabot Township, and P.1105 for Kelvin Township were published in 1976, at a scale of 1:15 840.

Acknowledgments

During the field work the author was assisted by: C.C. Storey, senior assistant, and A. Aubut, L. Stegenda and G. Timbers, junior assistants. Their help in carrying out the mapping project is greatly appreciated.

The author wishes to thank Howard Lovell, Resident Geologist, Ministry of Northern Development and Mines, Kirkland Lake, for valuable help and discussions during the field season; and Mr. and Mrs. G. Cruickshank for their many courtesies and help during the mapping project.

GENERAL GEOLOGY

The main lithological groups shown on the map face are listed in Table 1. The consolidated rocks range in age from Early to Late Precambrian and the unconsolidated materials belong to the Cenozoic.

The Early Precambrian (Archean) metavolcanic-metasedimentary rocks comprise an interlayered sequence of subalkalic metavolcanic rocks and clastic and ferruginous metasediments; these are the oldest rocks, underlying about 75% of the map area. They form the northern limb of a synclinorium in the western two-thirds of the map area (west of the Kelvin Lake Fault) and the central part of a synclinorium in the eastern third of the area (east of the Kelvin Lake Fault). The oldest supracrustral rocks occur in this western two-thirds of the map area while the youngest rocks occur in the eastern third. There is a marked change in the character of the rocks on either side of the Kelvin Lake Fault. West of the fault, the rocks are mainly mafic tholeiitic and calcalkalic flows which dip predominantly south-southeastwards. East of the fault, the volcanic rocks are mainly intermediate calcalkalic tuffs, and form the upper part of the sequence. Interlayered with these tuffs are ultramafic komatiites regarded largely as flows by the author because of the presence of spinifex and variolitic textures; lesser ultramafic lapilli tuffs are also present. Pillowed and amygdaloidal textures in the tholeiitic and calcalkalic flows and graded bedding, flame structures and load casts in the tuffs indicate that the volcanic rocks were laid down subaqueously. Interlayered with the volcanic rocks in the upper part of the sequence in eastern Kelvin Township are clastic metasediments.

Metamorphosed mafic intrusive rocks comprise lens shaped sills which were emplaced in both the lower and upper part of the sequence. Intrusive contact phenomena such as chilled margin effects and crosscutting relationships were observed, and constitute the evidence used for mapping these rocks as a separate unit.

Felsic intrusive rocks are confined to the lower part of the sequence in Cabot Township. These rocks comprise the Togo Batholith located along the western boundary of Cabot Township, and the Claw Lake Stock occurring at Claw Lake. These bodies are not in contact and their relative ages are not known. Both, however, show intrusive relationships with the surrounding rocks. The Togo Batholith consists predominantly of a coarse grained, porphyritic hornblende-biotite granodiorite containing large metasomatic, zoned phenocrysts of microcline. The Claw Lake Stock consists mainly of dark grey-green, coarse grained quartz diorite with a marginal leucocratic porphyritic phase of the same lithology.

Diabase dikes of two ages occur in the area. The oldest comprise a north-northwesterly, northerly, and north-northeasterly trending set which cut all the rocks previously described. These are chemically tholeiitic and are mainly around 30.5 m (100 feet) wide. These dikes are in turn cut by a later east-southeasterly trending dike set which is alkalic.

EARLY PRECAMBRIAN (ARCHEAN)

METAVOLCANICS

The classification of metavolcanic rocks used is that of Irvine and Baragar (1971) except in the case of the ultramafic metavolcanic rocks where Jensen's (1976) classification is used. The analyzed rocks described in this report are plotted on Figure 2 and Figure 3 to separate the alkalic from the subalkalic rocks. The subalkalic rocks are then further plotted on Figure 4 to separate the tholeiitic from the calcalkalic rocks. Figure 5 is used to separate mafic tholeiitic from calcalkalic rocks. All the subalkalic rocks are plotted on Figure 6 to subdivide these rocks into basalt, andesite, dacite, and rhyolite.

Ultramafic Metavolcanics

The ultramafic rocks are altered but their relict mineralogy and lithological characteristics suggest that these rocks belong to the komatiitic suite. The occurrence of spinifex and variolitic textures imply that the rocks are extrusive.

TABLE 1: TABLE OF LITHOLOGIC UNITS FOR CABOT AND KELVIN TOWNSHIPS

PHANEROZOIC

CENOZOIC

QUATERNARY

PLEISTOCENE AND RECENT

Sand, gravel, swamp and alluvial deposits.

Unconformity

PRECAMBRIAN

EARLY TO LATE PRECAMBRIAN

MAFIC INTRUSIVE ROCKS

Alkalic diabase: porphyritic, leucocratic.

Intrusive Contract

Tholeiitic diabase: massive, porphyritic, leucocratic: tholeittic diabase with pink feldspar.

EARLY PRECAMBRIAN (ARCHEAN)

FELSIC INTRUSIVE ROCKS

Granodiorite, trondhjemite, quartz diorite, aplite, porphyry.

Intrusive

METAMORPHOSED MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS

Gabbro, quartz gabbro, olivine gabbro, serpentinite.

Intrusive Contact

METAVOLCANICS AND METASEDIMENTS

METASEDIMENTS

Wacke-chert, wacke, chert, argillite-chert, argillite, ironstone.

METAVOLCANICS

FELSIC METAVOLCANICS

Aphanitic, porphyritic, foliated; agglomerate, lapilli tuff.

TABLE 1: Continued

INTERMEDIATE METAVOLCANICS

Aphanitic, porphyritic, pillowed, amygdaloidal, medium to coarse grained flows; tuff, lapilli tuff, tuff-chert, tuff-breccia, pillow breccia, agglomerate.

MAFIC METAVOLCANICS

Aphanitic, porphyritic, pillowed, medium to coarse grained, amygdaloidal, variolitic, light grey flows; pillow breccia, lapilli tuff, tuff-breccia, tuff, agglomerate.

ULTRAMAFIC METAVOLCANICS

Serpentinite, serpentinite breccia, variolitic serpentinite, green carbonate rock, yellow carbonate rock.

TABLE 2: CHEMICAL ANALYSIS (WEIGHT PERCENT) AND SPECIFIC GRAVITY OF A SELECTED ALTERED ULTRAMAFIC ROCK

Specimen Number	Z12-31
SiO_2	49.1
Al_2O_3	11.6
Fe_2O_3	2.70
FeO	9.52
MgO	10.0
CaO	4.76
Na_2O	1.38
K_2O	0.37
TiO_2	0.64
P_2O_5	0.08
S	0.05
MnO	0.35
CO_2	3.34
H_2O^+	5.58
H_2O^-	0.96
Total	100.4
Specific Gravity:	2.74

Basaltic komatiite; 0.4 km from the head of Michiwakenda Lake, southeastern Kelvin Township.

TABLE 3: MOLECULAR NORM, NORMATIVE PLAGIOCLASE COMPOSITION AND MOLECULAR COLOUR INDEX OF A SELECTED ALTERED ULTRAMAFIC ROCK

Specimen Number	Z12-31
Quartz	7.72
Corundum	0.57
Acmite	0.0
Orthoclase	2.44
Albite	13.81
Anorthite	25.75
Leucite	0.0
Nepheline	0.0
Kaliophilite	0.0
Diopside	0.0
Hedenbergite	0.0
Enstatite	30.77
Ferrosilite	15.07
Forsterite	0.0
Faylite	0.0
Hematite	0.0
Magnetite	2.49
Ilemnite	0.99
Apatite	0.19
Pyrrhotite	0.19
Total	100.0
Normative Plagioclase:	Labradorite (An_{65})
Molecular Colour Index:	49

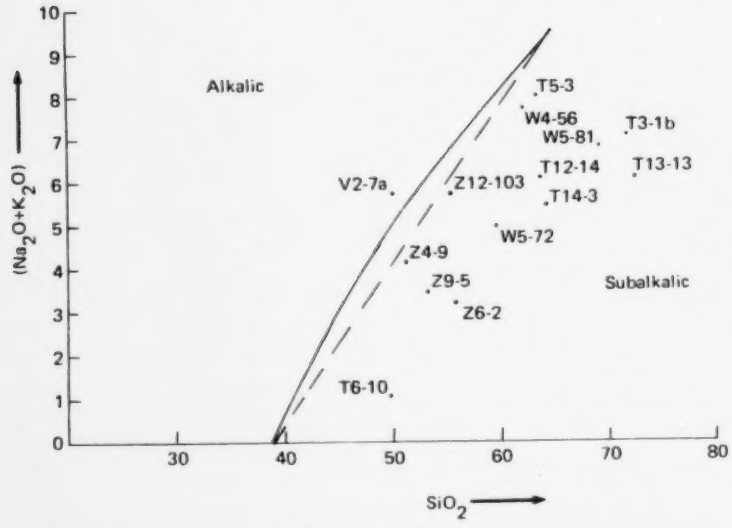


Figure 2. *Alkalies-silica plot of selected metavolcanic rocks. Dashed line is MacDonald's (1968) dividing line, solid line is Irvine and Baragar's (1971) dividing line.*

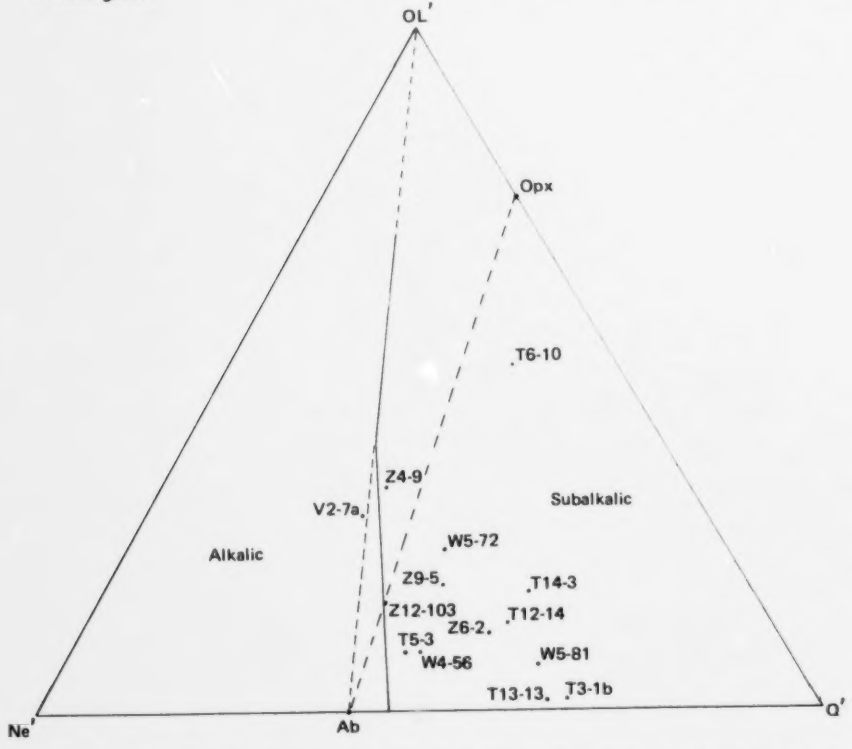


Figure 3. *Ol'-Ne'-Q' projections of selected metavolcanic rocks. Ol'-Ab join is trace of Yoder and Tilley's (1962) "critical plane of silica saturation". Heavy line is Irvine and Baragar's (1971) dividing line.*

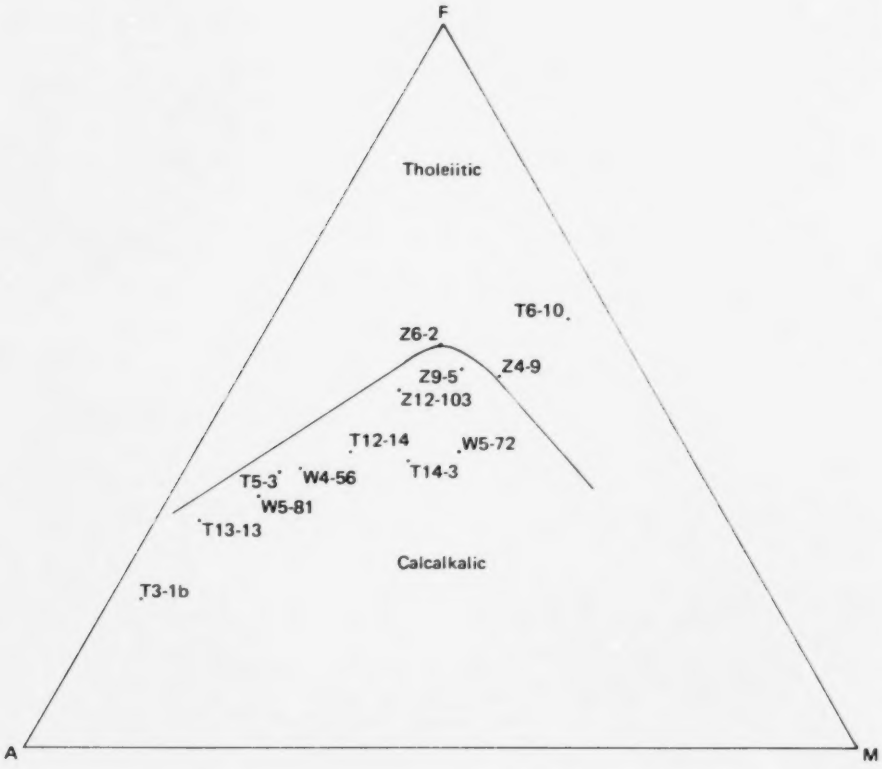


Figure 4. *AFM plot of selected metavolcanic rocks. A = $Na_2O + K_2O$; F = FeO + 0.8998 Fe_2O_3; M = MgO, all in weight percent (dividing line from Irvine and Baragar 1971).*

Ultramafic Komatiite

These are blue-black, fine grained rocks confined to the uppermost part of the sequence and best exposed in the eastern part of Kelvin Township. The rocks form units varying in thickness from about 30.5 m (100 feet) to about 304.8 m (1000 feet).

Spinifex textured serpentinites are blue-black in colour and show spinifex texture on both the weathered and fresh surfaces, the texture being more readily seen on the former. This texture consists of black, disoriented, acicular mafic minerals 2 mm long enclosing white weathering, interstitial, aphanitic material. The texture of this rock as seen in thin section is shown in Photo 1 and shows subparallel euhedral and subhedral crystals of skeletal olivine completely replaced by secondary chalcedonic quartz in an aphanitic, brown matrix which is interpreted to be largely divitrified glass. This matrix shows aggregate polarization and consists of stellate, parallel and plumose crystals of low birefringence, probably clinopyroxene. It contains irregular patches of carbonate, and irregular areas of opaque magnetite with a spongy appearance, some of which form herringbone structure. Square cubes of chromite are scattered through the thin section. The magnetite replaces and outlines the olivine in some cases.

Serpentinite breccia consists of angular and subangular fragments of greenish-grey aphanitic rock ranging from 3 mm x 4 mm to 35 mm x 45 mm, set in a blue-black matrix similar to the unbrecciated blue-black aphanitic serpentinite described above. In thin section, the clasts consist of serpentinized and car-

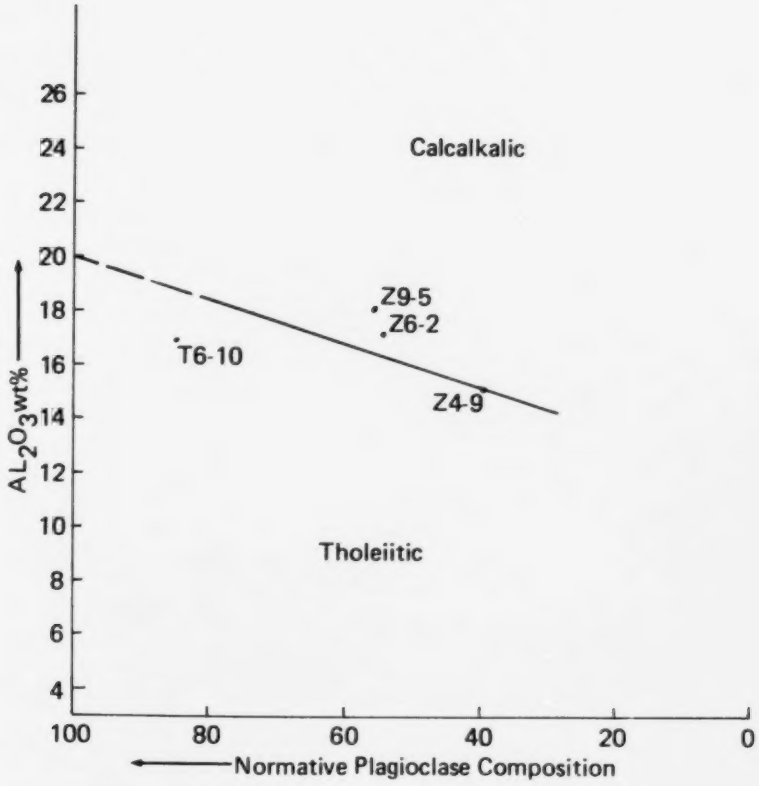


Figure 5. *Al_2O_3 weight percent-normative plagioclase composition plot of selected mafic metavolcanic rocks. Dashed line is Irvine and Baragar's (1971) dividing line.*

bonatized euhedral and subhedral grains of olivine set in a very fine grained, brown, carbonatized matrix. The matrix material is similar to that of the clasts but is black instead of brown because of disseminated magnetite. The serpentine pseudomorphs after olivine in the interclast material are anhedral. Disseminated square, rectangular and triangular grains of chromite are scattered throughout the thin section.

Basaltic Komatiite

Typically, basaltic komatiite is a brecciated, variolitic serpentinite containing autoclasts showing irregular varioles 2 mm long by 3 mm wide consisting of purplish-grey material set in blue-black serpentinite. Many of the varioles coalesce to form composite, ill-defined variolitic areas up to 15 mm by 23 mm. In thin section, the varioles consist of euhedral and subhedral grains of serpentinized olivine set in a very fine grained, dark brown matrix which is almost isotropic and some of which shows brownish interference colours. The intervariole material is made up of brecciated varioles showing cataclastic and mylonitic texture and containing carbonate. Some of the varioles have a carbonatized matrix. The chemical analysis of this rock is given in Table 2, and the molecular norm in Table 3. The rock is

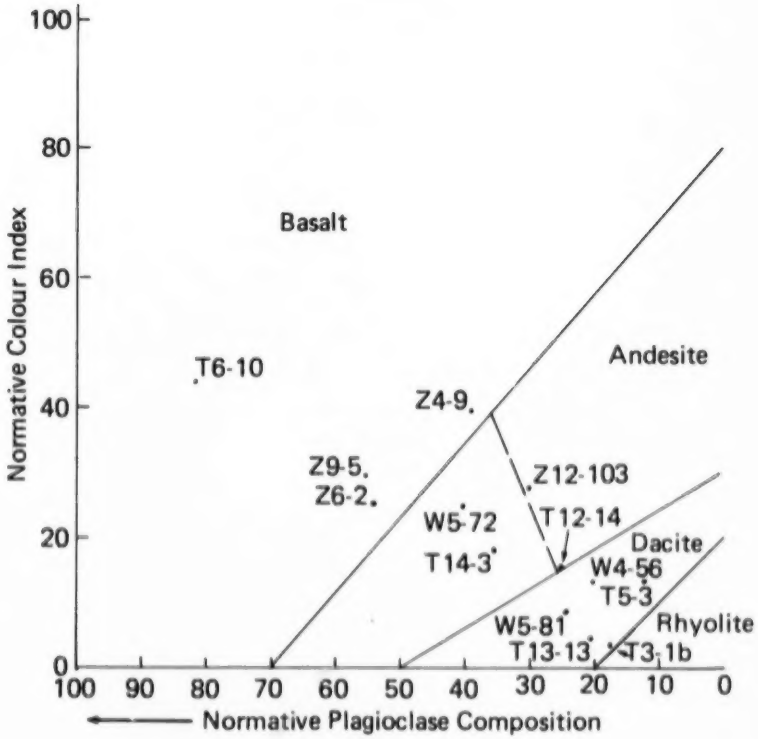


Figure 6. *Normative colour index-normative plagioclase composition plot of selected subalkalic metavolcanic rocks. Data in percentage cation equivalents.*

classed as a basaltic komatiite in the chemical classification of Jensen (1976). The chromium content of this rock is 1380 ppm, and the nickel content 690 ppm.

Carbonatized Ultramafics

Carbonate rocks, green and yellow in colour, occur associated with the ultramafic rocks. These rocks weather to a limonitic rind up to 3 mm thick, and locally the surface is pitted. The weathered surface also shows the same spinifex texture visible on some of the ultramafic rocks. These carbonate rocks are therefore interpreted as carbonatized derivatives of the ultramafic rocks.

Mafic Metavolcanics

Flows

These rocks are tholeiitic or calcalkalic in character and are dark, medium or light green, or dark grey, or medium grey in colour. They are predominantly aphyric but porphyritic varieties do occur. Pillowed and amygdaloidal primary structures were observed and these serve to indicate the extrusive nature of the rocks. In general it was not possible to ascertain the thickness of the flows, but in one case, near the southeastern shore of Macfie Lake, near the central part of the northern boundary of Cabot Township, two contiguous flows were found to be 60.9 m and 18 m thick respectively. Coarse grained facies of the mafic metavolcanics were interpreted as

Photo 1. *Photomicrograph of ultramafic komatiite showing euhedral and subhedral grains of olivine replaced by secondary silica. Plane polarized light.*

interior parts of flows where no evidence of intrusive contact phenomena were seen. Foliate and schistose secondary structures are well developed especially in the aureoles of the granitic rocks in southwestern and southern Cabot Township. Away from the aureoles of these granitic rocks, that is, in southeastern Cabot Township and throughout Kelvin Township, such structures are absent. Mafic metavolcanic rocks are best developed in Cabot Township and south central Kelvin Township.

Aphanitic, massive, nonporphyritic rocks are dark green and medium green, or dark grey or medium grey in colour. Chemical analysis of examples of the medium grained and medium grey rocks shows that they are tholeiitic, while chemical analysis of the grey rocks indicates that they are calcalkalic in the classification of Irvine and Baragar (1971).

One sample (T6-10) of the medium-green rock is described. It is massive and in thin section consists of a granoblastic aggregate of dusky brownish epidote, colourless grains of calcite and irregular areas of quartz showing aggregate polarization. The chemical analysis of this sample is given in column 1 of Table 4, and the molecular norm in column 1 of Table 5. The rock is classed as a high-alumina tholeiitic basalt in the chemical classification of Irvine and Baragar (1971). The rock contains 7.41 weight percent MgO (dry basis) but is classed as a high-iron tholeiite in the classification of Jensen (1976).

An example of the medium grey rocks (sample Z4-9) shows, in thin section, evidence of having been quickly cooled. Very narrow skeletal and swallow-tail acicular microlites of plagioclase (oligoclase An_{20}) and glomeroporphyritic, lath shaped and equant euhedral oligoclase crystals are set in a brownish, carbonatized, very fine grained matrix which is regarded by the author as divitrified glass. The lath shaped plagioclase phenocrysts also show straight extinction in the symmetrical section and are therefore oligoclase (An_{20}). The chemical analysis of this rock sample is given in column 2 of Table 4, and the molecular norm in column 2 of Table 5. The rock is classed as a tholeiitic basalt in the chemical

TABLE 4: CHEMICAL ANALYSIS (WEIGHT PERCENT), AND SPECIFIC GRAVITY OF SELECTED SUBALKALIC MAFIC METAVOLCANIC ROCKS

Column Number	1	2	3	4
Specimen Number	T6-10	Z4-9	Z6-2	Z9-5
SiO_2	46.4	49.1	53.3	51.3
Al_2O_3	15.7	14.7	16.5	17.5
Fe_2O_3	3.42	12.8*	1.98	2.00
FeO	8.53	n.d.	5.90	6.20
MgO	6.89	7.08	3.02	3.99
CaO	10.2	8.34	9.63	10.5
Na_2O	0.97	3.92	2.97	2.94
K_2O	0.01	.05	.10	.38
TiO_2	0.79	.91	1.24	1.27
P_2O_5	0.00	.02	.07	.04
S	0.00	.00	.46	.12
MnO	0.21	.28	.18	.21
CO_2	2.84	n.d.	2.36	1.45
H_2O^+	4.26	n.d.	2.31	2.39
H_2O^-	0.17	n.d.	.14	.21
L.O.I.	n.d.	4.15	n.d.	n.d.
Total	100.4	101.3	100.2	100.5
Specific Gravity	2.92	2.90	2.81	2.87

Name and location of specimens:
1. Tholeiitic basalt, high alumina, medium green; southeastern shore of Cabot Lake, northeastern Cabot Township.
2. Tholeiitic basalt, greenish-grey; about 1.6 km (1 mile) southeast of Lucid Lake, southern Cabot Township.
3. Calcalkalic basalt, high alumina, medium grey; about 1.2 km (3/4 mile) southeast of the central part of the southern shore of Claw Lake, south Cabot Township.
4. Calcalkalic basalt, high alumina, dark grey; southeastern corner of Kelvin Township.

Notes:
*Total iron as Fe_2O_3
n.d. not determined.

classification of Irvine and Baragar (1971). It contains 7.37% MgO on a dry basis and is classed as a high-magnesian tholeiite in the classification of Jensen (1976).

Analyzed examples (Table 4) of the dark grey rocks show that these are high-alumina calcalkali basalts in the classification of Irvine and Baragar (1971). Two examples are described. One rock (sample Z6-2) consists of disoriented and sheaf-like skeletal microlites of saussuritized plagioclase, some with forked ends and a few laths of altered plagioclase, in a dark brown, very fine grained matrix which is considered to be devitrified glass. The matrix also contains irregular patches of calcite and curved veinlets of chlorite. Irregularly shaped opaque grains of pyrite are scattered through the matrix. The chemical analysis of this rock is given in column 3 of Table 4, and the molecular norm in column 3 of Table 5. The second rock (sample Z9-5) described shows in thin section randomly oriented altered microlites of plagioclase feldspar set in a pale brownish matrix containing irregular patches of calcite and grains of epidote. Opaque grains of pyrite are disseminated through the slide. Larger laths of less altered plagioclase (An_{48}), sometimes grouped to give a glomeroporphyritic texture, occur within the section. The chemical analysis is given in column 4 of Table 4 and the molecular norm in

TABLE 5: MOLECULAR NORM, MOLECULAR COLOUR INDEX AND NORMATIVE PLAGIOCLASE COMPOSITION OF SELECTED SUBALKALIC MAFIC METAVOLCANIC ROCKS

Column Number	1	2	3	4
Specimen Number	T6-10	Z4-9	Z6-2	Z9-5
Quartz	4.58	0.00	11.38	4.79
Corundum	0.00	0.00	0.00	0.00
Acmite	0.00	0.00	0.00	0.00
Orthoclase	0.07	0.31	0.63	2.35
Albite	9.55	36.49	28.26	27.56
Anorthite	42.17	23.20	33.28	34.92
Leucite	0.00	0.00	0.00	0.00
Nepheline	0.00	0.00	0.00	0.00
Kaliophilite	0.00	0.00	0.00	0.00
Diopside	6.45	9.71	8.62	9.75
Hedenbergite	4.21	5.95	4.86	5.62
Enstatite	17.63	4.34	4.53	6.63
Ferrosilite	11.52	2.66	2.56	3.82
Forsterite	0.00	8.30	0.00	0.00
Faylite	0.00	5.09	0.00	0.00
Hematite	0.00	0.00	0.00	0.00
Magnetite	2.63	2.61	2.19	2.18
Ilmenite	1.21	1.31	1.83	1.85
Apatite	0.00	0.04	0.16	0.09
Pyrrhotite	0.00	0.00	1.69	0.46
Total	100.02	100.01	100.01	100.20
Molecular Colour Index:	44	40	25	30
Normative Plagioclase:	Bytownite An_{6}	Andesine An_{39}	Labradorite An_{54}	Labradorite An_{5}

Name and location of specimens: same as Table 4.

column 4 of Table 5. The rock is classed as a calcalkalic basalt in the chemical classification of Irvine and Baragar (1971).

Porphyritic mafic metavolcanics, uncommon within the map area, occur in Cabot Township. These rocks are dark green in colour and consist of equant feldspar, usually well crystallized, 0.6 to 1.3 cm across. In one case the porphyritic basalt formed the upper part of a flow with the number of phenocrysts increasing towards the upper surface of the flow. In thin section the feldspar phenocrysts are seen to be epidotized and are associated with equant grains of pale green actinolite showing ragged terminations surrounded by irregular areas of altered feldspar, some of which are lath shaped.

Pillowed flows are dark green, medium green, dark grey, medium grey and light grey rocks. Both tholeiitic and calcalkalic rocks are pillowed. The pillows are loaf shaped or ellipsoidal, range in size from 0.3 to 1.2 m, and in some cases chilled margins 2.54 cm thick occur. They are draped over each other and interstitial material was not observed.

Medium to coarse grained (about 1mm) flows are non-porphyritic, dark green rocks lacking intrusive contacts. They occur associated with the fine grained basalts and are regarded as coarse grained interior parts of flows. These coarser grained facies occur within the dark green tholeiitic basalts, and within the dark grey calcalkalic basalts.

Pillow breccia is uncommon in the map area. It was observed in only one place, at an outcrop 1.2 km south-southwest of Macfie Lake in northwestern Cabot Township, about 91.4 m south of the gravel road leading to Mattagami Lake. Here, rectangular fragments of the pillowed basalt measuring 0.6-30.5 cm occur in a disoriented array amongst the pillows. The fragments lie in fine grained basaltic material. They occur in an outcrop that consists entirely of pillows.

Amygdaloidal mafic metavolcanics are uncommon and were observed only in Cabot Township. The amygdules are irregular to ellipsoidal in shape and consist of white calcite. They are small, measuring 1-2 mm in greatest dimension.

Mafic agglomerates are best exposed in the neighbourhood of an unnamed lake in central Cabot Township. This rock type forms impersistent units, varying from 91.4 to 152.0 m thick, which can be traced in a northeasterly and southwesterly direction into the northeastern and southwestern parts of the township. Similar rocks are developed in the southern part of the township south of Claw Lake. The rock type consists of bombs (10-22.9 cm in length) of porphyritic intermediate metavolcanics, elongated in the direction of the regional trend, set in a dark, greenish-black aphanitic mafic matrix. The units are enclosed in pillowed mafic metavolcanic units and appear to indicate periods of subaerial volcanic activity.

One variolitic flow unit was mapped in southeastern Cabot Township near the northern shore of the northeastern arm of Claw Lake. The flow is about 45.7 m thick and consists of varioles 0.3 cm across showing radiating, acicular feldspar crystals. The basalt is of the blackish-green type, and is probably tholeiitic.

Pyroclastic Rocks

Tuff-breccia was mapped in southern Cabot Township in an area to the northwest of Claw Lake. The rock consists of angular blocks 7.6 cm across of intermediate metavolcanic rock in a dark basaltic matrix.

Intermediate Metavolcanics

Flows

These rocks are grey or greenish grey, or dark green aphanitic rocks belonging to the calcalkalic series in the classification of Irvine and Baragar (1971). Both andesites and dacites are represented, and aphyric and porphyritic types were observed. Pillowed and amygdaloidal lithostructures were also observed in these rocks, and these together with the fine grain size serve to indicate a volcanic nature. These rocks are commonest in eastern Kelvin Township, east of the Kelvin Lake Fault.

Aphanitic, massive, non-porphyritic andesites and dacites are dark, and medium green, greenish-grey, and grey rocks. The chemical analyses of two rocks classed as calcalkalic andesites in the classification of Irvine and Baragar (1971) are shown in Table 6, columns 1 and 2. The texture of one of these rocks is shown in Photo 2. In thin section it shows randomly oriented microlites of altered feldspar, with a few larger altered lath shaped feldspar grains in a quartzose, brown, carbonatized and chloritized matrix, forming a pilotaxitic texture. Spongy, irregular, opaque and translucent grains of epidote occur. The composition of the clear parts of the altered microlites is albite (An_1), some of microlites are oligoclase (An_{20}). The other rock, which is greenish-grey in colour, shows flow oriented microlites of feldspar (An_{20}) in an aphanitic pale brown and dark brown matrix. The dark brown areas are carbonatized whereas the pale brown areas are almost isotropic. It is believed by the author that the matrix was originally glass, and it can be observed that those areas which are almost isotropic show intersertal texture with the microlites and the carbonatized areas. Sparse, irregular grains of pyrite are scattered through the rock. The chemical analyses of two dacites are shown in columns 3 and 4 of Table 6. Their molecular norms are shown in columns 3 and 4 of Table 7. Both are classed as calcalkalic dacites in the classification of Irvine and Baragar (1971). The texture of one of these rocks is shown in Photo 3. This rock is megascopically aphanitic and dark green and shows, in thin section, porphyritic texture with subhedral lath shaped phenocrysts of fresh plagioclase

TABLE 6: CHEMICAL ANALYSIS (WEIGHT PERCENT), AND SPECIFIC GRAVITY OF SELECTED SUBALKALIC INTERMEDIATE METAVOLCANIC ROCKS

Column Number	1	2	3	4	5
Specimen Number	T12-14	Z12-103	T5-3	W5-81	T14-3
SiO_2	61.1	51.2	62.3	68.0	62.0
Al_2O_3	16.1	16.1	17.3	14.7	14.6
Fe_2O_3	1.78	9.61*	1.59	1.56	1.86
FeO	4.30	n.d.	4.52	2.84	4.37
MgO	2.67	3.54	1.79	1.26	3.95
CaO	2.64	6.56	2.02	2.43	3.36
Na_2O	4.02	5.16	7.75	3.97	3.35
K_2O	1.81	.13	.09	2.67	1.88
TiO_2	1.27	.92	.62	.66	.63
P_2O_5	.16	.02	.20	.10	.08
S	.02	.00	.00	.01	.29
MnO	.08	.17	.09	.07	.10
CO_2	1.39	n.d.	.33	.12	1.05
H_2O+	2.84	n.d.	1.77	1.33	2.29
H_2O^-	.25	n.d.	.11	.13	.37
L.O.I.	n.d.	6.91	n.d.	n.d.	n.d.
Total	100.4	100.3	100.5	99.9	100.2
Specific Gravity:	2.69	2.74	2.71	2.69	2.72

Name and location of specimens:
1. Calcalkalic andesite, high alumina, medium green; from Kelvin Creek, near the central part of the northern boundary of Kelvin Township.
2. Calcalkalic andesite, high alumina, light greenish-grey; 3.6 km south-southeast of Kelvin Lake, Kelvin Township.
3. Calcalkalic dacite, high alumina, dark green; about 0.8 km southeast of the southern end of Macfie Lake, northern Cabot Township.
4. Calcalkalic dacite, grey-green; about 1.6 km northeast of the central arm of Claw Lake, south central Cabot Township.
5. Calcalkalic andesitic tuff, medium green; from the eastern shore of Grassy Lake, northeastern corner of Kelvin Township.

Notes:
*Total iron as Fe_2O_3
n.d. Not determined

feldspar (albite-oligoclase An_{10}) in a patchy matrix of slightly altered feldspar, chlorite and quartz. Irregular grains of carbonate, epidote and opaque and translucent leucoxene are scattered through the matrix. The epidote forms ptygmatic veins crossing the thin section. The other rock is light grey-green in colour containing amygdules of quartz, 2-7 mm long by 1-2 mm wide, which are aligned in parallel orientation. In addition to these quartz amygdules, equant phenocrysts of quartz also occur. In thin section, this rock is very fresh and shows equant subhedral phenocrysts of plagioclase (oligoclase, An_{28}) and elongated amygdules of composite quartz in a matrix of flow oriented microlites of plagioclase (oligoclase An_{20}). Some of the amygdules contain carbonate in haphazard fashion, others show cores of granular epidote, some contain irregular chlorite, and in others the chlorite forms an ovoid layer within the amygdule. Spongy, brownish,

TABLE 7: MOLECULAR NORM, MOLECULAR COLOUR INDEX AND NORMATIVE PLAGIOCLASE COMPOSITION OF SELECTED SUBALKALIC INTERMEDIATE METAVOLCANIC ROCKS

Column Number	1	2	3	4	5
Specimen Number	T12-14	Z12-103	T5-3	W5-81	T14-3
Quartz	19.01	0.06	7.07	25.25	19.68
Corundum	3.56	0.00	1.37	1.23	1.29
Acmite	0.00	0.00	0.00	0.00	0.00
Orthoclase	11.21	0.82	0.53	16.22	11.56
Albite	37.79	49.65	69.33	36.61	31.28
Anorthite	12.62	21.86	8.68	11.71	16.80
Leucite	0.00	0.00	0.00	0.00	0.00
Nepheline	0.00	0.00	0.00	0.00	0.00
Kaliophilite	0.00	0.00	0.00	0.00	0.00
Diopside	0.00	5.90	0.00	0.00	0.00
Hedenbergite	0.00	4.42	0.00	0.00	0.00
Enstatite	7.72	7.53	4.92	3.57	11.34
Ferrosilite	3.88	5.64	5.15	2.54	3.90
Forsterite	0.00	0.00	0.00	0.00	0.00
Faylite	0.00	0.00	0.00	0.00	0.00
Hematite	0.00	0.00	0.00	0.00	0.00
Magnetite	1.95	2.71	1.66	1.68	2.02
Ilmenite	1.85	1.37	0.86	0.94	0.91
Apatite	0.35	0.05	0.42	0.22	0.17
Pyrrhotite	0.07	0.00	0.00	0.04	1.05
TOTAL	100.01	100.01	99.99	100.01	100.00
Molecular Colour Index:	15	28	13	9	18
Normative Plagioclase:	Andesine An_{25}	Andesine An_{31}	Oligoclase An_{11}	Oligoclase An_{24}	Andesine An_{35}

Name and location of specimens: same as Table 6

irregularly shaped grains of epidote are scattered through the rock, sometimes outlining the feldspar grains.

Intermediate porphyritic rocks consist of grey and pale greenish-grey phenocrysts of feldspar ranging in size from 2-4 mm where equant, or up to 5 mm in length where elongated and 2 mm wide. These rocks are grey-green in colour.

Pillowed flows occur predominantly in northern Kelvin Township. Here the pillows are loaf shaped and range in size from 0.6-1.2 m. These pillows are commonly amygdaloidal consisting of quartz-calcite amygdules varying in size from 2-15 mm.

Amygdaloidal flows are massive fine grained rocks consisting of white calcite amygdules 2-4 mm across. These rocks are fairly common and occur predominantly along the northern boundaries of Cabot and Kelvin Townships. The amygdules are mostly uniformly distributed in the rocks and show no marked concentration within them. In a few cases the amygdules are entirely of quartz. These quartz amygdules are ellipsoidal in shape and vary in size from 1 m by 2 mm to 2 mm by 7 mm.

Medium to coarse grained flows are rare, and were designated on the map where intrusive contacts with adjoining rocks were not observed. The rocks are

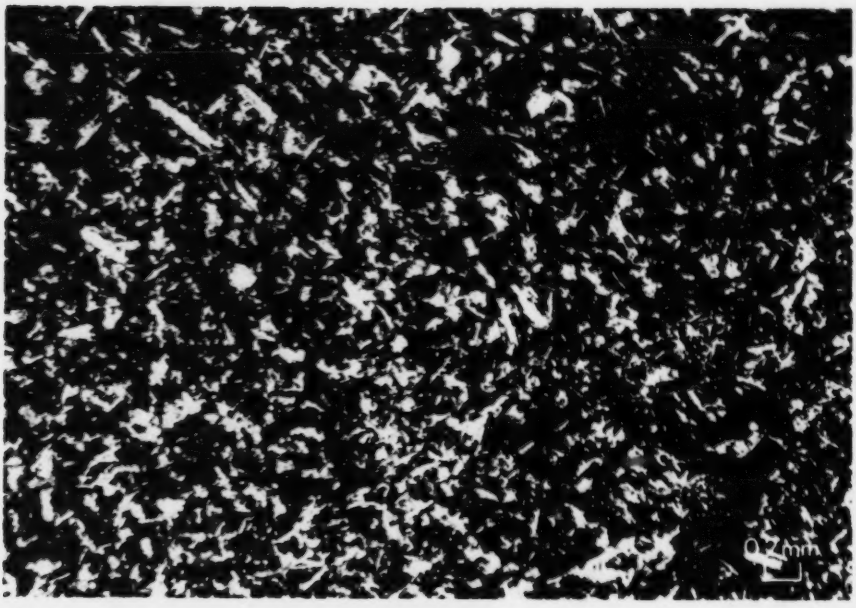


Photo 2. *Photomicrograph of aphanitic andesite. Crossed polarizers.*

Photo 3. *Photomicrograph of megascopically aphanitic dacite. Crossed polarizers.*

green in colour and the grain size is 0.5-1.00 mm. Apart from the coarser grain size the rock type is similar to the green intermediate aphanitic rocks.

Pillow breccias are rare within the map area being confined to the northern part of Kelvin Township. The units consist of fragmented pillows, the fragments consisting of angular disoriented blocks of pillows up to 10 cm in longest dimension. They are very local in occurrence and do not form distinct lithological units.

Pyroclastic Rocks

Agglomerates are not widespread in the map area, but are commonest in central Cabot Township where they occur in a northeast trending zone about 1524 m wide, centred on a lake in the central part of the township, 2.4 km north of the western end of Claw Lake. The rocks are medium green and consist of elongated, rounded bombs of intermediate feldspar porphyry, 7.6 cm x 2.54 cm to 30.5 cm x 15.2 cm in size, set in an aphanitic matrix or a crystal tuff consisting of feldspar crystals 2 mm in average diameter. Less commonly the clasts are angular or consist of aphanitic intermediate rocks. The clasts are similar to the material forming the flows.

Tuff-breccia has been observed in two places only: in east central Cabot Township and north central Kelvin Township. The rock type consists of angular blocks up to 45.7 cm in length of porphyritic andesite containing feldspar phenocrysts in a dark green crystal tuff matrix. The crystal tuff matrix contains phenocrysts of feldspar 3 mm across.

Lapilli tuff is a fairly widespread rock type best developed in central Cabot Township where it forms a northeasterly trending unit about 457.2 m wide. Within this unit the rocks grade into aphanitic rocks and tuff in northeasterly and southwesterly directions. The rock type consists of grey-green, and in some cases light grey, aphanitic subangular and subrounded fragments ranging in size from 5-20 mm, in a dark grey-green aphanitic matrix. The lighter grey fragments are more felsic than the matrix. The rocks are unsorted and no bedding could be observed in outcrop; however, owing to the distinctive nature of these rocks it was not difficult to map their trend.

Tuff is a common and widespread rock type in the eastern half of Kelvin Township and forms about 20% of the volcanic rocks. The rocks are grey or greenish grey, massive, unstratified, and are predominantly crystal tuffs. Two types are common: a fine grained tuff consisting of grains less than 0.5 mm and a coarser grained tuff consisting of equant grains between 1.0 and 1.5 mm in size. The crystals are feldspar. On the weathered surface the rocks are grey to brownish grey. The chemical analysis of a typical example of the coarse tuffs is given in column 5 of Table 6, and the molecular norm in column 5 of Table 7. The microtexture of this rock is shown in Photo 4, and its unsorted nature is evident. It consists of grains of plagioclase (andesine An_{32}), quartz, hornblende, chlorite, calcite, epidote, cloudy untwinned potash feldspar and square, rectangular and irregularly shaped opaque grains of ilmenite altered to leucoxene, in a matrix of altered potassic feldspar. The grains are angular, subrounded and rounded. In the classification of Irvine and Baragar (1971) the rock is a calcalkalic andesite.

Tuff-chert is a composite unit varying from 15 cm to about 30.5 cm thick. It forms graded bedded units consisting of a lowermost unit of coarse crystal tuff of average grain size 2 mm grading into a middle unit of fine grained tuff, the average size of grains being 0.5 mm, which in turn grades into an aphanitic uppermost part consisting of chert. These units are characteristic of the uppermost part of the metavolcanic sequence in the area. The lower coarse and fine tuff units are exactly similar to the tuff described above; but in the tuff-chert unit, a cherty uppermost portion is always present.

Felsic Metavolcanics

Flows

Felsic metavolcanics are not abundant within the map area, and form less than 1/10 of the volcanic assemblage. The largest outcrop occurs in northwestern Cabot

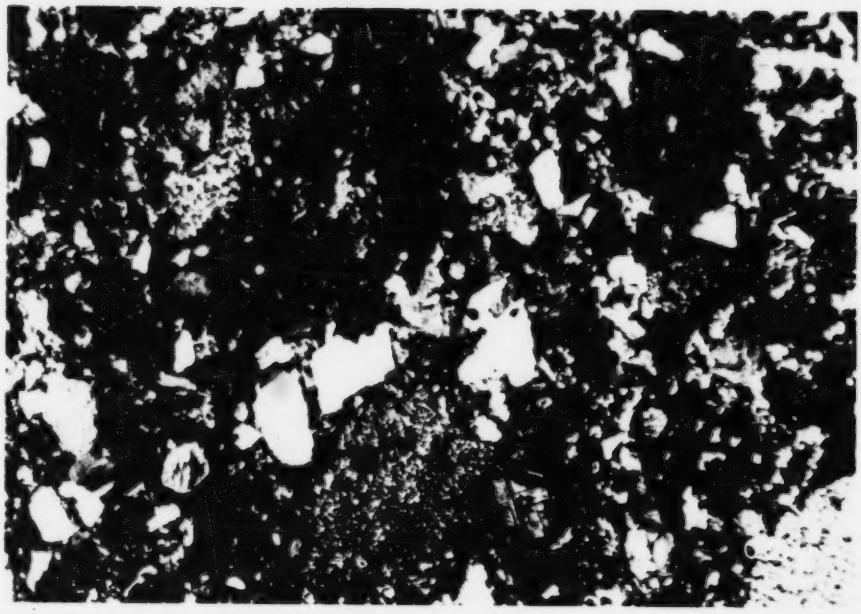


Photo 4. *Photomicrograph of andesitic tuff. Crossed polarizers.*

Township in the northwestern part of the map area. The rocks are light grey, greyish-white, pale cream and pale pink in colour, and are commonly structureless.

Aphanitic units are structureless rocks and may be flows or tuffs. Fragmental structures cannot be observed even on the weathered surface. Very often these rocks contain disseminated fine grained pyrite about 0.5 mm in size which causes the weathered surface to appear pale brown. The chemical analysis of one of these rocks is given in column 1 of Table 8 and the molecular norm in column 1 of Table 9. The rock is classed as a calcalkalic dacite in the classification of Irvine and Baragar (1971), but because of the high silica content, the rock is classed as a rhyolite by the author. The texture of the rock is shown in Photo 5. It consists of phenocrysts of carbonatized and sericitized euhedral and subhedral grains of feldspar in a microcrystalline quartzofeldspathic matrix. The feldspar phenocrysts show flow alignment. The feldspar phenocrysts are not visible on the weathered surface.

Porphyritic flows consist of phenocrysts of quartz varying from 1 x 1 mm to 7 mm x 6 mm or feldspars measuring 3 mm x 2 mm in a grey aphanitic matrix. The chemical analysis of one of these rocks showing only quartz phenocrysts is given in column 2 of Table 8. The molecular norm is given in column 2 of Table 9. In the classification of Irvine and Baragar (1971) the rock is classed as a calcalkalic rhyolite. The texture of this rock is shown in Photo 6. Euhedral and subhedral phenocrysts of quartz and sericitized plagioclase feldspar (albite, An_8) showing albite and Carlsbad twinning, are set in a microcrystalline quartzofeldspathic matrix containing much muscovite and lesser amounts of biotite and calcite.

Foliated felsic flows occur in northwestern Cabot Township close to the area of the granitic rocks. Elsewhere the rocks are unfoliated.

Pyroclastic Rocks

Agglomerate was mapped only in the northwestern part of the map area in northwestern Cabot Township. The rocks are interlayered with the porphyritic rhyolite. The agglomerate consists of felsic bombs 13-30 cm in longest dimension

TABLE 8: CHEMICAL ANALYSIS (WEIGHT PERCENT) AND SPECIFIC GRAVITY OF SELECTED SUBALKALIC FELSIC METAVOLCANIC ROCKS

Column Number Specimen Number	1 T13-13	2 T3-1b
SiO_2	70.4	70.5
Al_2O_3	14.2	16.7
Fe_2O_3	1.84	1.02
FeO	1.24	.95
MgO	.49	.33
CaO	2.29	1.43
Na_2O	4.73	3.84
K_2O	1.11	3.08
TiO_2	.51	.24
P_2O_5	.06	.02
S	.00	.00
MnO	.04	.03
CO_2	1.96	1.49
H_2O^+	1.07	1.10
H_2O^-	.26	.15
Total	100.2	100.9
Specific Gravity:	2.65	2.62

Name and location of specimens:
1. Calcalkalic dacite, pale pink; 213 m east of Kelvin Creek, northern Kelvin Township.
2. Calcalkalic rhyolite, high alumina, light grey; northwest corner of Cabot Township, 1.2 km north-northweast of Ketchiwaboose Lake.

TABLE 9: MOLECULAR NORM, MOLECULAR COLOUR INDEX AND NORMATIVE PLAGIOCLASE COMPOSITION OF SELECTED SUBALKALIC FELSIC METAVOLCANIC ROCKS

Column Number Specimen Number	1 T13-13	2 T3-1b
Quartz	32.00	30.95
Corundum	1.36	5.03
Acmite	0.00	0.00
Orthoclase	6.83	18.67
Albite	44.17	35.33
Anorthite	11.41	7.14
Leucite	0.00	0.00
Nepheline	0.00	0.00
Kaliophilite	0.00	0.00
Diopside	0.00	0.00
Hedenbergite	0.00	0.00
Enstatite	1.41	0.94
Ferrosilite	0.00	0.49
Forsterite	0.00	0.00
Faylite	0.00	0.00
Hematite	0.10	0.00
Magnetite	1.99	1.09
Ilmenite	0.74	0.34
Apatite	0.13	0.43
Pyrrhotite	0.00	0.00
Total	100.14	100.41
Molecular Colour Index:	4	3
Normative Plagioclase	Oligoclase An_{21}	Oligoclase An_{17}

Name and location of specimens: same as Table 8

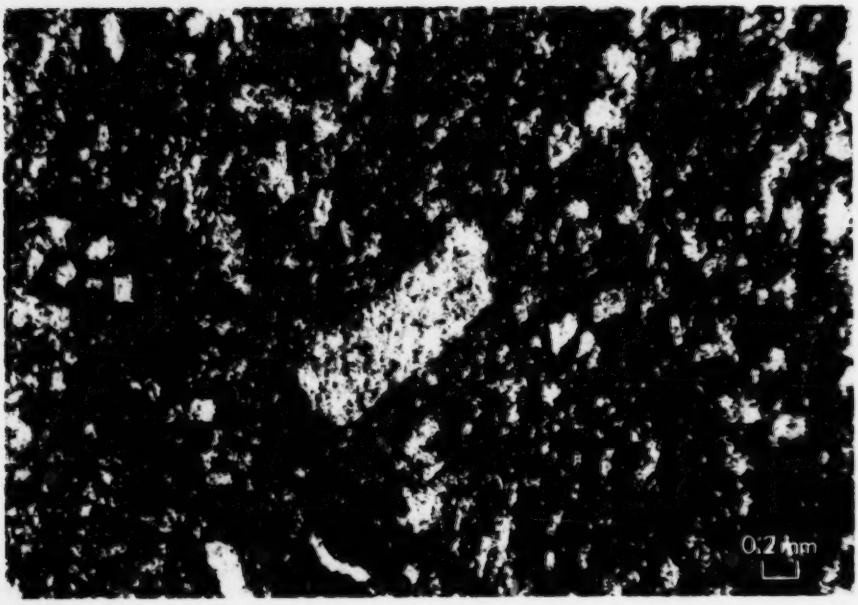


Photo 5. *Photomicrograph of porphyritic rhyolite. Crossed polarizers.*

Photo 6. *Photomicrograph of porphyritic rhyolite. Crossed polarizers. Black areas are holes in the thin section.*

TABLE 10: CHEMICAL ANALYSIS (WEIGHT PERCENT) AND SPECIFIC GRAVITY OF SELECTED MAFIC INTRUSIVE ROCKS

Column Number Specimen Number	1 T4-9	2 T13-12	3 Z2-1
SiO_2	49.8	44.3	56.9
Al_2O_3	12.5	11.9	15.5
Fe_2O_3	4.20	2.59	4.61
FeO	12.0	8.83	4.22
MgO	5.70	14.8	4.73
CaO	8.02	9.99	6.76
Na_2O	1.99	1.59	3.28
K_2O	.06	.02	0.25
TiO_2	1.24	.51	.91
P_2O_5	.07	.03	0.18
S	.08	.02	0.01
MnO	.22	.19	0.13
CO_2	.50	.15	0.11
H_2O^+	3.43	4.25	2.36
H_2O^-	.21	.53	0.35
Total	100.00	99.7	100.3
Specific Gravity:	2.97	2.98	2.86

Name and location of specimens:
1. Quartz gabbro, tholeiitic, high iron, dark green; 0.4 km west of the central part of the western shore of Macfie Lake, northern Cabot Township.
2. Olivine gabbro, tholeiitic, picritic, dark green; 274 m east of Kelvin Creek, in the northeastern part of Kelvin Township.
3. Quartz gabbro, tholeiitic, dark green; southwestern corner of Cabot Township.

TABLE 11: MOLECULAR NORM, MOLECULAR COLOUR INDEX AND NORMATIVE PLAGIOCLASE COMPOSITION OF SELECTED MAFIC INTRUSIVE ROCKS

Column Number Specimen Number	1 T4-9	2 T13-12	3 Z2-1
Quartz	6.39	0.00	12.82
Corundum	0.00	0.00	0.0
Acmite	0.00	0.00	0.0
Orthoclase	0.38	0.12	1.53
Albite	19.27	14.80	30.54
Anorthite	26.98	26.21	27.84
Leucite	0.00	0.00	0.0
Nepheline	0.00	0.00	0.0
Kaliophilite	0.00	0.00	0.0
Diopside	5.94	15.27	3.01
Hedenbergite	6.43	4.71	1.57
Enstatite	14.01	5.35	12.04
Ferrosilite	15.18	1.65	6.29
Forsterite	0.00	22.03	0.0
Faylite	0.00	6.80	0.0
Hematite	0.00	0.00	0.0
Magnetite	3.09	2.18	2.61
Ilmenite	1.86	0.74	1.32
Apatite	0.16	0.70	0.39
Pyrrhotite	0.30	0.72	0.04
Total	99.99	101.28	100.0
Molecular Colour Index:	47	59	27
Normative Plagioclase:	Labradorite An_{52}	Labradorite An_{54}	Andesine An_{48}

Name and location of specimens: same as Table 10

containing quartz phenocrysts 0.6 cm across in a grey aphanitic felsic matrix. The bombs are made up of the same grey quartz porphyries as described above.

Lapilli-tuff is represented by one mapped exposure occurring at Claw Lake in southern Cabot Township. It forms a small area of outcrop consisting of angular, grey, disoriented fragments of felsic volcanic rock occurring as rectangular and triangular clasts ranging in length from 25 mm to 32 mm, in a fine grained matrix. The clasts and the matrix are of the same composition and the fragmental nature of the rock is only discernible on the weathered surface.

METAVOLCANICS AND METASEDIMENTS

Metasedimentary rocks are not abundant within the map area, forming less than 1/10 of the rocks exposed. They occur mostly in the eastern part of the region in the upper part of the sequence, where they are interlayered with tuffaceous metavolcanic rocks.

Wacke is a black, massive rock on the fresh surface, and greyish-white on the weathered surface. It shows scattered grains of white-weathering feldspar 0.5 mm x 0.5 mm across set in a dark aphanitic argillaceous matrix. In some cases this wacke shows regular banding, the bands being 3-5 mm thick. This rock type consists of very fine grained layers of wacke alternating with coarser grained layers consisting of feldspar grains 0.5 mm across in an aphanitic matrix.

Wacke-chert is a composite unit consisting of wacke similar to that described above and chert at the uppermost part of each bed. A regular gradation from wacke to chert can be observed. These composite units vary from 15 mm to 25 mm thick. The chert is aphanitic and grey in colour.

Units of chert also occur independently, interlayered with volcanic rocks. These units vary from 11-16 cm thick. They are grey-green in colour with hardness greater than 6.5 on the Mohs scale. The rock shows banding and minute grain size variation, some of the bands show contorted layering. In thin section the rock consists of fine particles of quartz and untwinned feldspar and sparse grains of greenish hornblende and yellow-green epidote in a light coloured matrix which polarizes dark grey. The slightly coarser grained part of the chert is seen under the microscope to contain irregular coarse grained clots which consist of subhedral and euhedral grains of altered twinned and untwinned feldspar, euhedral fresh hornblende, irregular patches of calcite, and grains of epidote in a fine grained matrix, which polarizes very dark grey. It is believed by the author that these bands mapped as chert are in some cases silicified tuffs.

Argillite constitutes massive aphanitic unbedded units which are black on the fresh surface and brownish-grey on the weathered surface. Sometimes a crude colour banding can be seen on the fresh and weathered surfaces. In such cases the bands vary from 2 mm to 4 mm thick. In thin section the rock shows the characteristic microbreccia texture of a wacke and consists predominantly of subangular, equant and elongated grains and chips of partly altered twinned and untwinned feldspar (a Baveno twin was recognized) and subhedral grains of fresh pale green hornblende and minor quartz in a brownish, aphanitic, dark-polarizing matrix. Many of the grains show serrated borders due to corrosion by the matrix, brought about by mild recrystallization of the matrix. Opaque accessory minerals consist of pyrite and leucoxene after ilmenite. The mineralogical composition of this rock is similar to the green crystal tuffs and the author believes that these black argillites are altered very fine grained tuffs.

Argillite-chert units consist of composite beds 7.5 cm thick grading from argillite at the base to chert at the top. Current ripple marks are present in the argillite base. The argillite and chert are similar to rock types described above.

METAMORPHOSED MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS

Gabbros are massive, medium grained to coarse grained, medium green rocks occurring as concordant lensoid and sill-like units interlayered with the metavolcanic rocks. They form masses varying from 45.7 m to 365.8 m thick. Three of these rocks have been chemically analyzed. Their chemical analyses are given in

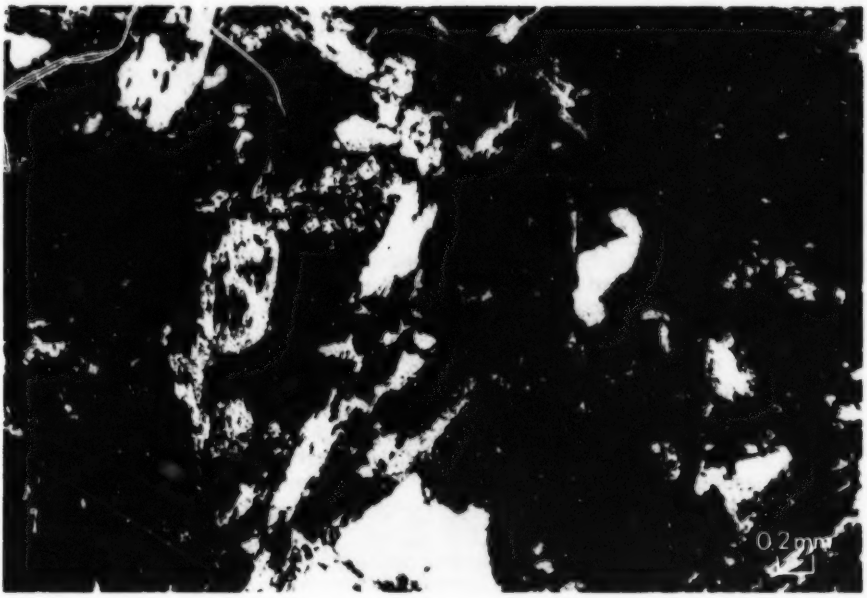


Photo 7. *Photomicrograph of tholeiitic metagabbro; black areas are holes in the thin section. Crossed polarizers.*

columns 1, 2 and 3 of Table 10 and their molecular norms in columns 1, 2, and 3, of Table 11. The textures of the first two of these rocks are shown in Photos 7 and 8 respectively.

The first example to be described is metamorphosed and shows brown, saussuritized lath shaped plagioclase, pale green actinolite showing ragged terminations and bent in places; irregularly shaped areas of micropegmatite, epidote, calcite, chlorite after actinolite, and quartz. Opaque minerals consist of leucoxene after ilmenite. The rock is considered by the author to be an altered oversaturated tholeiitic gabbro, and is classed chemically as tholeiitic in the classification of Irvine and Baragar (1971).

The second example described is a dark green to black coarse grained rock. In thin section the rock is hypidiomorphic granular containing broad, lath shaped, subhedral, saussuritized, plagioclase, fresh and altered clinopyroxene (the alteration products of clinopyroxene are actinolite and chlorite) and serpentinized, euhedral and anhedral olivine. The opaque mineral is ilmenite which shows alteration in some grains to leucoxene. Much of the plagioclase is altered to brownish epidote. The rock is considered to be an olivine gabbro, and in the chemical classification of Irvine and Baragar (1971) the rock is of tholeiitic picritic affinity. It is thus classed as an olivine tholeiitic gabbro. The smaller euhedral olivine crystals are enclosed by the clinopyroxene, but the larger anhedral olivine crystals form interlocking grains with the pyroxene. Thus the olivine grains are interpreted as having been formed in two generations, the smaller earlier than the clinopyroxene, the larger, at the same time.

The third rock is a massive medium grained, medium green rock on the fresh surface. The weathered surface is brown. Owing to metamorphic effects it is difficult to determine the grain size accurately in hand specimen. The rock is classed chemically as tholeiitic in the classification of Irvine and Baragar (1971) and is a tholeiitic quartz gabbro from petrographic examination.

FELSIC INTRUSIVE ROCKS

Felsic intrusive rocks occur in two places within the map area: (1) along the western boundary of Cabot Township, and (2) in the south central part of Cabot Township at Claw Lake. The rocks in the two areas are not in contact but are separated by metavolcanic rocks. The rocks in the first area form the eastern part of a complex batholith extending westwards, whereas the rocks at Claw Lake form a circumscribed stock. For convenience the former body is called the Togo Batholith, as it underlies the township of Togo immediately to the west of Cabot Township, and the latter the Claw Lake Stock.

The Togo Batholith

Within the map area this batholith is exposed over an area 6 km long by 1.8 km wide, at its widest part. The eastern boundary of the batholith is in faulted contact with the metavolcanic rocks, whereas its southern border shows an intrusive relationship with these rocks.

Porphyritic, medium grained biotite-hornblende granodiorite containing euhedral phenocrysts of buff microcline 4 cm long by 3 cm wide, and equant vitreous subhedral quartz grains 7 mm long by 5 mm wide is the predominant rock type within the area mapped. The matrix of this rock is hypidiomorphic granular and consists of anhedral quartz, subhedral plagioclase (albite, An_3), anhedral interstitial microcline, euhedral and subhedral hornblende, and lath shaped biotite, with accessory sphene, epidote, leucoxene and pyrite. The microcline phenocrysts contain inclusions of the matrix minerals and appear to be late metasomatic as the phenocryst material extends out into the interstices of the matrix. The mode of this rock is given in column 1 of Table 12, and the rock is a porphyritic granodiorite in the classification of Ayres (1972).

Massive biotite granodiorite is less abundant than the porphyritic variety. It is a buff coloured medium grained rock, and some of the quartz grains are red in

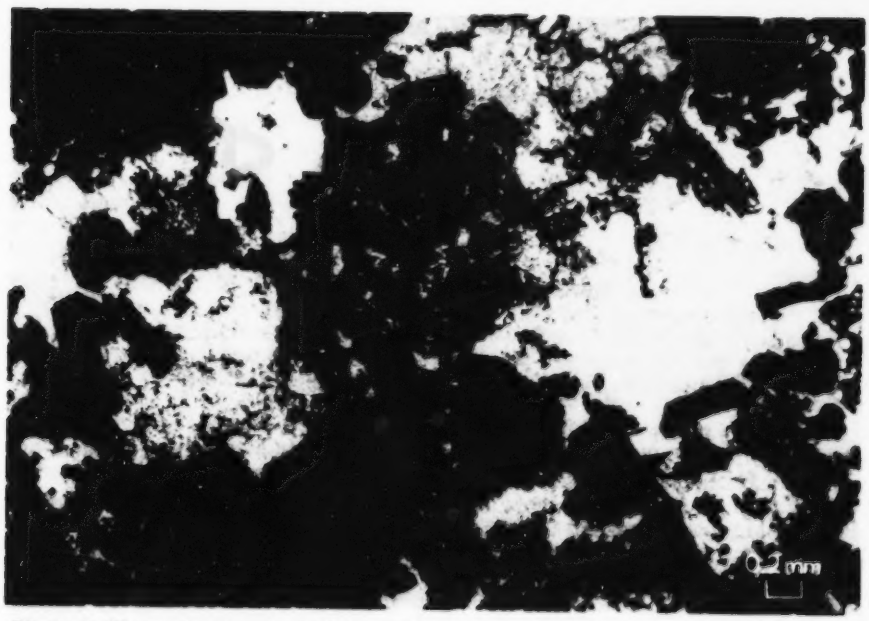


Photo 8. *Photomicrograph of olivine gabbro. Crossed polarizers.*

TABLE 12: MODAL PERCENTAGES* OF MINERALS IN SELECTED GRANITIC ROCKS

Column Number	1	2	3	4	5
Pluton	Togo Batholith			Claw Lake Stock	
Specimen Number	V1-1a	V1-1b	V2-5	Z4-4	W4-68
Quartz	30	25	30	20	26
Potassic feldspar	14	8	19	-	1
Plagioclase	54	56	51	61†	69
Micropegmatite	-	-	-	-	-
Muscovite	-	-	-	-	-
Biotite	1	8	x	-	-
Hornblende	1	2	-	18	-
Epidote	x	-	x	-	-
Chlorite	-	1	-	-	4
Pyrite	-	-	x	1	-
Sphene	-	x	-	-	-
Apatite	-	-	-	-	-
Leucoxene	-	-	-	x	-
Calcite	-	-	-	x	-
Perthite	-	-	-	-	-
Total	100	100	100	100	100
Plagioclase Composition	An_{9}	An_{12}	An_{12}	Indeterminate	An_{6}
Potassic Feldspar / Total Feldspar Ratio	1/5	1/8	1/4	-	<1/8
Rock Name	Granodiorite	Granodiorite	Granodiorite	Quartz diorite°	Trondhjemite

* x indicates that less than 1% of the mineral is present
† Altered feldspar, (hornblende and chloritized hornblende)
°Name deduced from chemical analysis
Name and location of specimens:

Togo Batholith:
1. Biotite-hornblende granodiorite; 457.2 m west of the northern part of the western shore of Ketchiwaboose Lake, northwestern Cabot Township.
2. Biotite-hornblende granodiorite; 457.2 m west of the northern part of the western shore of Ketchiwaboose Lake, northwestern Cabot Township.
3. Biotite granodiorite; 609.6 m west of the southern part of the western shore of Ketchiwaboose Lake, northwestern Cabot Township.

Claw Lake Stock:
4. Quartz diorite, massive, dark green; 122 m southeast of the southeastern part of Lucid Lake, southwestern Cabot Township.
5. Trondhjemite, massive, pink; from the eastern shore of the western end of Claw Lake, southwestern Cabot Township.

TABLE 13: CHEMICAL ANALYSIS (WEIGHT PERCENT), AND SPECIFIC GRAVITY OF SELECTED GRANITIC ROCKS FROM THE CLAW LAKE STOCK.

Column Number Specimen Number	1 Z4-4	2 W5-77	3 W3-56	4 W4-68
SiO_2	59.2	60.9	70.7	67.6
Al_2O_3	15.1	16.1	17.0	17.6
Fe_2O_3	3.68	3.03	0.38	0.35
FeO	3.84	3.69	0.77	1.54
MgO	4.35	2.94	0.57	1.01
CaO	5.99	4.99	1.61	1.69
Na_2O	3.14	3.10	6.16	6.75
K_2O	0.92	1.54	1.53	1.50
TiO_2	0.91	0.81	0.24	0.28
P_2O_5	0.17	0.16	0.07	0.10
S	<0.01	0.07	0.02	0.05
MnO	0.16	0.11	0.02	0.03
CO_2	0.29	0.91	0.75	0.93
H_2O^+	1.92	2.04	0.40	0.83
H_2O^-	0.31	0.40	0.34	0.36
Total	100.0	100.8	100.6	100.7
Specific Gravity:	2.86	2.81	2.65	2.65

Name and location of specimens:
1. Quartz diorite, massive, dark green; 122 m southeast of the southeastern part of Lucid Lake, southwestern Cabot Township.
2. Quartz diorite porphyry, mottled dark grey; 609.6 m north of the southern shore of the central peninsula of Claw Lake, southern Cabot Township.
3. Trondhjemite porphyry, buff; 122 m east of the northern end of Lucid Lake, southwestern Cabot Township.
4. Trondhjemite, massive, pink; from the eastern shore of the western end of Claw Lake, southwestern Cabot Township.

colour because of hematite staining which causes them superficially to resemble garnet. In thin section the rock is hypidiomorphic granular consisting of euhedral and subhedral grains of patchy clouded plagioclase (oligoclase An_{12}), interstitial microcline, quartz, biotite, hornblende, and minor epidote. Some of the alkali feldspar is microcline-perthite of the "patch-perthite" variety. The mode of this rock is given in column 2 of Table 12. In the classification of Ayres (1972) this rock is a granodiorite.

Leucogranodiorite is a massive buff coloured rock with colour index less than 1. It contains red hematite stained quartz. In thin section, the rock shows allotriomorphic granular texture, and consists of anhedral quartz, coarse quartz-microcline and quartz-albite micropegmatite and anhedral cloudy plagioclase (An_{12}). Accessory minerals consist of pale green epidote, pale green biotite, and streaks of pale green chlorite. The mode of this rock is given in column 3 of Table 12. The rock is classed as a granodiorite in the classification of Ayres (1972).

Aplite occurs as ramifying dikes ranging in width from 3 to 61 cm cutting the porphyritic and massive granitic rocks. The rock is buff coloured, fine grained and megascopically devoid of mafic minerals.

The Claw Lake Stock

The Claw Lake Stock is an irregularly shaped body elongated in the direction of the regional trend of the volcanic rocks which it intrudes. The stock is 3.6 km long by 1.2 km wide at its widest (central) part.

TABLE 14: MOLECULAR NORM, MOLECULAR COLOUR INDEX AND NORMATIVE PLAGIOCLASE COMPOSITION OF SELECTED GRANITIC ROCKS FROM THE CLAW LAKE STOCK

Column Number Specimen Number	1 Z4-4	2 W5-77	3 W3-56	4 W4-68
Quartz	17.51	20.26	22.70	15.53
Corundum	0.00	0.73	2.66	2.21
Acmite	0.0	0.0	0.0	0.0
Orthoclase	5.64	9.46	9.01	8.82
Albite	29.23	28.92	55.07	60.23
Anorthite	25.30	24.64	7.50	7.68
Leucite	0.0	0.0	0.0	0.0
Nepheline	0.0	0.0	0.0	0.0
Kaliophilite	0.0	0.0	0.0	0.0
Diopside	2.93	0.0	0.0	0.0
Hedenbergite	0.57	0.0	0.0	0.0
Enstatite	10.99	8.43	1.57	2.77
Ferrosilite	2.13	2.50	0.55	1.62
Forsterite	0.0	0.0	0.0	0.0
Faylite	0.0	0.0	0.0	0.0
Hematite	0.0	0.0	0.0	0.0
Magnetite	3.99	3.29	0.40	0.36
Ilmenite	1.32	1.17	0.33	0.39
Apatite	0.37	0.35	0.15	0.21
Pyrrhotite	0.04	0.25	0.07	0.17
Total	100.0	100.0	100.0	100.0
Molecular Colour Index:	22	15	3	5
Normative Plagioclase:	Andesine An_{46}	Andesine An_{49}	Oligoclase An_{12}	Oligoclase An_{11}

Name and location of specimens: same as Table 13

Massive quartz diorite is the commonest rock type within the stock. It is a medium grained, greenish grey rock showing irregular, pale grey areas of feldspar and lath shaped crystals of hornblende. In thin section, it consists of anhedral quartz showing wavy extinction, dark brownish subhedral and anhedral saussuritized and chloritized feldspar, too altered for optical determination of composition, and subhedral and anhedral pale green hornblende. Interstitial micropegmatite consisting of graphic quartz and altered feldspar occurs in some parts of the thin sections. No potassic feldspar was observed after staining for this mineral. Opaque minerals consist of pyrite and ilmenite-leucoxene. The mode of the rock is given in column 4 of Table 12. The chemical analysis of the rock is given in column 1 of Table 13 and the molecular norm in column 1 of Table 14. In the classification of Ayres (1972) the rock is a quartz diorite.

Porphyries constitute the next most abundant rock type in the Claw Lake Stock. They are of two kinds: a dark green and a pale buff variety. In both cases the matrix is aphanitic. The dark green types resemble the massive diorites but show greyish white to buff phenocrysts of feldspar measuring 3 mm x 3 mm and/or colourless, vitreous phenocrysts of quartz of approximately the same size. Three thin sections of these are described. In all cases the feldspar is cloudy and no potassic feldspar has been determined by sodium-cobaltinitrite staining. One of these rocks shows euhedral and subhedral phenocrysts of cloudy, brownish plagioclase feldspar (albite, An_7) and euhedral and subhedral phenocrysts of

quartz showing undulose extinction in an altered, microgranular, quartzofeldspathic matrix, through which rectangular laths of muscovite, acicular strips of green biotite, irregular areas of calcite, and opaque grains of ilmenite and pyrite are scattered. The second of these porphyries consists of phenocrysts of altered brownish feldspar only (albite, An_4), set in a coarse, quartzofeldspathic matrix containing chlorite, calcite and irregular opaque grains of leucoxene. The feldspar of the matrix is altered to brownish material. The third thin section shows subhedral grains of saussuritized feldspar containing considerable amounts of epidote set in a matrix of micropegmatite containing irregular areas of pale green chlorite, and irregular and rectangular opaque areas of pyrite. Owing to the thoroughly altered condition of the feldspars, this porphyry cannot be classified from thin section examination alone. However, a chemical analysis of the granophyric example just described shows this rock to be a quartz diorite porphyry in the classification of Ayres (1972). The chemical analysis of this rock is given in column 2 of Table 13 and the molecular norm is given in column 2 of Table 14.

The buff coloured porphyries have a colour index less than 1. They contain phenocrysts of quartz and/or feldspar averaging 3 mm x 3 mm in size. In thin section one of these rocks contains single and composite anhedral and subhedral grains of quartz showing undulose extinction, euhedral and subhedral cloudy plagioclase (albite, An_6) grains (many of which contain lath shaped grains of muscovite oriented parallel to the pinacoidal cleavages) in a microgranular quartz-altered plagioclase feldspar matrix. Opaque grains consist of cubes of pyrite. A stringer of quartz and calcite transects the rock. Although this rock was stained for potassic feldspar, no staining effects were observed, and although the matrix feldspar is altered and brownish, it is plagioclase of composition An_6, the same as the phenocrysts. The rock is thus a trondhjemite porphyry. A second quartz-feldspar porphyry is similar except that the plagioclase phenocrysts are too altered for optical determination and the quartzofeldspathic matrix is finer and contains muscovite, chloritized biotite, chlorite, and scattered grains of opaque pyrite marginally altered to hematite. Staining for potassic feldspar was negative. The chemical analysis of this rock is given in column 3 of Table 13 and the molecular norm is given in column 3 of Table 14. The rock is classed as a trondhjemite porphyry in the classification of Ayres (1972).

Massive biotite (chloritized) trondhjemite forms a very minor phase of the Claw Lake Stock. The rock type is pink and medium grained with a colour index of about 5. In thin section the rocks display anhedral grains of quartz showing wavy extinction occurring both as large composite grains and interstitial, single and composite grains; and anhedral and subhedral cloudy brownish grains of plagioclase (albite, An_6) with interstitial, altered potassic feldspar, microline and quartz-orthoclase micropegmatite. Pale green biotite and chloritized biotite, muscovite, epidote, calcite, apatite, and opaque cubes of pyrite make up the rest of the rock. Many of the plagioclase grains are altered to sericite, the flakes occurring parallel to the cleavage directions. The mode of the rock is given in column 5 of Table 12. The chemical analysis of this rock is given in column 4 of Table 13 and the molecular norm in column 4 of Table 14. The rock is classed as a trondhjemite in the classification of Ayres (1972).

EARLY TO LATE PRECAMBRIAN

MAFIC INTRUSIVE ROCKS

Tholeiitic Diabase Dikes

Diabase dikes of tholeiitic character have a northwest to north-northeast trend within the map area, but most of the dikes follow a northwesterly trend within this directional range.

Massive diabases are medium to fine grained, black, highly magnetic rocks which weather dark rusty brown. They are the commonest types and have a normative molecular colour index ranging from 29 to 45. Two thin sections of typical rocks are described, one from a northwesterly trending dike and one from a northeasterly trending dike. The thin section from the northwesterly trending dike, a

TABLE 15: CHEMICAL ANALYSIS (WEIGHT PERCENT) AND SPECIFIC GRAVITY OF SELECTED MAFIC INTRUSIVE ROCKS (DIABASE DIKES)

Column Number Specimen Number	1 V3-29	2 V4-1	3 V2-7a
SiO_2	46.2	49.2	48.8
Al_2O_3	12.6	13.3	16.5
Fe_2O_3	4.90	4.80	5.13
FeO	12.6	10.4	7.44
MgO	4.48	5.07	4.53
CaO	8.93	8.58	7.16
Na_2O	2.31	2.68	3.96
K_2O	1.06	1.02	1.68
TiO_2	2.66	1.51	1.56
P_2O_5	.48	.11	.44
S	.21	.13	.16
MnO	.29	.22	.18
CO_2	.13	.11	.17
H_2O^+	1.83	2.46	1.39
H_2O^-	.33	.29	.49
Total	99.0	99.9	99.6
Specific Gravity:	3.07	2.99	2.91

Name and location of specimens:
1. Quartz diabase, tholeiitic; from northwesterly trending dike, central Cabot Township.
2. Quartz diabase, tholeiitic; from northeasterly trending dike, near Mattagama Lake road in the middle part of northern Cabot Township.
3. Diabase, alkalic, sodic; from east-southeasterly trending dike, about 0.8 km west of the southern part of Ketchiwaboose Lake, northwestern Cabot Township.

TABLE 16: MOLECULAR NORM, MOLECULAR COLOUR INDEX AND NORMATIVE PLAGIOCLASE COMPOSITION OF SELECTED MAFIC INTRUSIVE ROCKS (DIABASE DIKES)

Column Number Specimen Number	1 V3-29	2 V4-1	3 V2-7a
Quartz	1.24	0.79	0.00
Corundum	0.00	0.00	0.00
Acmite	0.00	0.00	0.00
Orthoclase	6.74	6.38	10.26
Albite	22.30	25.45	36.71
Anorthite	22.46	22.48	23.01
Leucite	0.00	0.00	0.00
Nepheline	0.00	0.00	0.00
Kaliophilite	0.00	0.00	0.00
Diopside	8.29	8.62	4.79
Hedenbergite	9.16	8.81	3.77
Enstatite	9.16	10.49	0.69
Ferrosilite	10.12	10.72	0.54
Forsterite	0.00	0.00	7.37
Faylite	0.00	0.00	5.80
Hematite	0.00	0.00	0.00
Magnetite	4.68	3.33	3.30
Ilmenite	3.99	2.23	2.24
Apatite	1.08	0.24	0.95
Pyrrhotite	0.78	0.48	0.57
Total	100.00	100.02	100.00
Molecular Colour Index:	45	44	29
Normative Plagioclase:	Andesine-labradorite An_{50}	Andesine An_{47}	Andesine An_{39}

Name and location of specimens: same as Table 15

medium to fine grained rock, shows coarse intergranular texture with broad, randomly oriented laths of variably altered plagioclase (labradorite, An_{54}) forming a framework enclosing clinopyroxene, micropegmatite, quartz and apatite. Opaque square, rectangular, triangular and irregular grains of magnetite, and ilmenite altered to leucoxene are scattered through the slide. The clinopyroxene shows alteration to biotite, chlorite and epidote, and the plagioclase to sericite. The chemical analysis of this rock is given in column 1 of Table 15 and the molecular norm in column 1 of Table 16. The rock is classified chemically as tholeiitic in the classification of Irvine and Baragar (1971), and is a tholeiitic diabase. The second rock described is a medium grained diabase from a northeasterly trending dike. In thin section this rock shows reverse intergranular texture in which large lath shaped clinopyroxenes form a framework enclosing lath shaped altered plagioclase, micropegmatite and quartz, with scattered irregular and skeletal grains of ilmenomagnetite showing alteration to leucoxene. The plagioclase shows alteration to sericite and is too altered for optical determination. The pyroxene is altered to hornblende, uralite, biotite, chlorite and epidote. The chemical analysis of this rock is shown in column 2 of Table 15 and the equivalent norm is given in column 2 of Table 16. The rock is classed as tholeiitic in the chemical classification of Irvine and Baragar (1971) and is therefore a tholeiitic diabase.

Diabase with pink feldspar is an uncommon rock type. The pink feldspar occurs as irregular patches within the rock, or as discrete grains. Comparison with similar rocks mapped in Leonard Township (Carter 1977a, p.26) indicates that this pink material is micropegmatite, and is a characteristic feature of the tholeiitic diabase dikes in the Shining Tree Area.

Porphyritic diabase is similar in all lithological aspects to the massive diabase except for the occurrence of yellow-green feldspar phenocrysts measuring on average 10 mm by 15 mm.

Leucocratic diabase is an uncommon rock type. It is grey in colour on the fresh surface, and has a colour index of about 15 whereas the measured colour index of the common diabase varies from 29 to 45. It forms northwesterly trending dikes in northeastern Cabot Township. The dikes are only very feebly magnetic in contrast to the normal diabase, and are of medium grain size and weather to a medium rusty-brown weathered surface.

Alkalic Diabase Dikes

A dike of this type with an east-southeasterly trend was observed in northwestern Cabot Township 0.8 km west of the southern part of Ketchiwaboose Lake. Other dikes of this trend are considered by the author to be of the same type.

The observed example of this type is a porphyritic, black, medium grained magnetic rock containing yellowish-green euhedral lath shaped and rectangular phenocrysts of feldspar measuring from 5 mm by 2 mm, to grains measuring 20 mm by 5 mm. These feldspar phenocrysts are in places grouped in glomeroporphyritic fashion. In thin section the rock shows intergranular texture consisting mostly of fresh lath shaped disoriented plagioclase (andesine, An_{35}) enclosing intergranular areas of clinopyroxene, primary hornblende and primary biotite. Opaque crystals of ilmenite-magnetite showing alteration to leucoxene occur as square, rectangular, triangular and irregular grains. Some of the plagioclase is altered to sericite and the clinopyroxene to hornblende, biotite, chlorite, and magnetite. The magnetite occurs both as square, rectangular and irregular grains in the altered and fresh minerals and as a border around the clinopyroxene. Although most of the hornblende and biotite is secondary some is primary as shown by the euhedral forms and lack of associated alteration. The chemical analysis of this rock is given in column 3 of Table 15 and the molecular norm in column 3 of Table 16. In the chemical classification of Irvine and Baragar (1971) the rock has an alkaline affinity based on the Ne'-Q'-Ol' (Figure 3) and SiO_2-alkalies (Figure 2) plots, and is classified with the sodic alkali-basalt series. The rock is not highly altered as shown by thin section examination and the combined content of H_2O^+ and CO_2 of 1.56 weight percent. The rock is thus classified as an alkali-diabase. On the basis

of its alkalic character, trend and relative age, this dike may be a member of the Sudbury dike swarm (Fahrig *et al.* 1965, p.287-289).

CENOZOIC

QUATERNARY

Pleistocene and Recent

Cenozoic deposits consisting of sand and swamp material occur within the map area both as discontinuous patches and larger areas.

Stony, silty sand till covers the southern half of Cabot Township and the southeastern part of Kelvin Township forming ground moraine deposits (Boissonneau 1965), overlying Early Precambrian (Archean) rocks.

Sand deposits forming sand plains cover most of northern Cabot Township and northwestern Kelvin Township and comprise glacial outwash deposits (Boissonneau 1965). The sands are pale brown, yellow and white and are angular fine sands. Occurring on those plains are narrow steep ridges of sand, up to about 18 m in relief, forming a set of sand dunes convex to the south-southeast. These are best seen in the region to the southeast of Cabot Lake in northeastern Cabot Township. Also associated with the dunes are glaciofluvial esker deposits comprising sand and lesser amounts of gravel trending west-southwesterly in northern Cabot Township. An esker was traced for about 0.6 km, trending southerly, in the southwestern part of Kelvin Township.

Swamp deposits consisting of muskeg form large areas in the southeastern part of Cabot Township and the southwestern and north central parts of Kelvin Township.

STRUCTURAL GEOLOGY

FOLDING

In the western two-thirds of the map area, west of the Kelvin Lake Fault, metavolcanic-metasedimentary rocks are mostly homoclinal, striking N50E and dipping 75°SE. In northwestern Cabot Township, however, rocks are folded about an axis striking N50E. It is concluded from these two facts that the major structure is synclinorial. In the eastern one-third of the map area, east of the Kelvin Lake Fault, rocks are folded about axes trending about N65E to N75E in the northern part, and about axes trending N35°W in the southern part. In the central part of this area the rocks strike approximately N-S. These directions are interpreted by the author to indicate a synclinal axis plunging E-NE, with lithological units forming an arcuate pattern concave to the east. The dips of the lithological units are steep, ranging from 65°E to 90°. These two regions, the western two-thirds and the eastern one-third, are separated by the Kelvin Lake Fault.

FAULTING

Faulting is not a prominent feature in the map area; however, three major faults cross the area, all striking N-NW. These are the Ketchiwaboose Lake Fault, near the western boundary of the map area, striking about N20W; the Kelvin Lake Fault in the east central part, striking about N30W; and the Grassy Lake Fault in the northeastern corner, striking N30W. The Ketchiwaboose Lake and the Kelvin Lake Faults cross the entire map area, and are 10 and 11 km long respectively, while the Grassy Lake Fault is about 2 km long. Evidence for the Ketchiwaboose Fault consists of a photolineament at the southern end of the fault in the region of Elephant Head Creek in southwestern Cabot Township, and straight form of the granite/metavolcanics contact northwest of Ketchiwaboose Lake, colinear with the photolineament. At the southern end of the Ketchiwaboose Fault, there is a steep scarp facing SW across Elephant Head Creek. This is interpreted as a fault scarp as the rocks were observed to be highly sheared and microfolded near the lineament. This fault continues S-SE into Connaught Township as the Elephant Head Lake Fault (Carter 1980). A fault scarp also exists on the east side of the lake with a relief of about 250 feet (NTS 41P/11, 1968). Southwest of the scarp the physiographic elevation is lower, suggesting that the region to the west of the fault is downthrown. On this evidence the Ketchiwaboose Fault is interpreted as a gravity fault downthrown to the west. This interpretation receives further support in Connaught Township, immediately to the south, where bedrock east of the continuation of this fault into that township is consistently at higher elevation, rising to 457 m about 0.8 km east of Elephant Head Lake (NTS 14P/11, 1968). The southern end of the Kelvin Lake Fault is also marked by a photolineament, and its continuation northwestwards is shown by elongation of contour elements in a NW direction. No marked scarp features were observed associated with this fault in the field, but lithologic and stratigraphic evidence in Kelvin Township and Churchill Township (Carter 1980) indicate downthrow to the east. The region between the Ketchiwaboose Lake and Kelvin Lake Faults is therefore considered to be an upfaulted block and can be referred to as the Claw Lake block. Similarily, the region immediately east of the Grassy Lake Fault rises abruptly from the level of Grassy Lake, about 335.3 m, to 487.7 m in Natal Township (NTS 41P/11, 1968), immediately to the east, a distance of just under 0.8 km. This fault is marked by a prominent scarp also facing SW, where the bedrock is at lower elevation. Because of these features, the fault is also interpreted as a gravity fault downthrown to the west. Downthrow on this fault to the west combined with downthrow to the east on the subparallel Kelvin Lake Fault to the west also serves to define a N-NW trending down-faulted block, which can be called the Bigfour Lake block. South of a line passing through the middle of Kelvin Lake and along the southern shore of Claw Lake, bedrock is at significantly higher level than to the north, and it is conjectured that this marks the location of a NE trending fault, possibly downthrown to the northwest.

CORRELATION OF GEOLOGY AND GEOPHYSICS

Aeromagnetic maps 285G (Rev.) and 286G (Rev.) ODM-GSC (1970) cover the townships of Cabot and Kelvin. Correlation with the geology is determined by considering the spacing, rate of change, and the trend of the aeromagnetic contours. When these factors are correlated with the geological map, the usefulness and limitations of the aeromagnetic map for the regional geological interpretation can be appreciated.

With respect to the regional structure as shown by the metavolcanic-metasedimentary group, no correlation with the aeromagnetic map texture can be obtained. The structural trend of the lithologic units is northeasterly in Cabot Township and in the southwestern half and in the northern part of Kelvin Township, but north-south in the eastern third of Kelvin Township. However, the aeromagnetic contours trend northwesterly over the entire area, and as such the aeromagnetic map cannot be used to deduce the regional structural trend.

Regional correlations with rock type can, however, be made in some instances. Thus, the intrusive bodies, the felsic plutonic rocks and diabase dikes can in general be rather clearly defined. The shape and location of the Claw Lake Stock is fairly well defined by an aeromagnetic high, and the faulted and intrusive boundaries of the Togo Batholith can also be seen. The trend of the diabase dikes is parallel to that of the trend of the aeromagnetic contours, and the aeromagnetic map can be confidently used to indicate the dike trends. Furthermore, the region underlain predominantly by mafic metavolcanic rocks can be distinguished from that underlain by intermediate metavolcanics and metasediments, for example, the terrain underlain by intermediate metavolcanic rocks in the eastern half of Kelvin Township is characterized by a lower contour density than that occurring to the west across the Kelvin Lake Fault which is underlain by mafic metavolcanics.

The trend of the major faults—the Ketchiwaboose Lake, the Kelvin Lake, and the Grassy Lake Faults—is paralleled by the trend of the aeromagnetic contours and marked by a sharp change in contour direction in the vicinity of these faults, to follow the fault-trend direction. This feature is also enhanced where different lithological types are brought together on either side of the fault. For example, in the case of the Kelvin Lake Fault there is a change in the density of the aeromagnetic contours on either side of the fault where mafic and intermediate metavolcanics are brought into juxtaposition.

ECONOMIC GEOLOGY

HISTORY OF EXPLORATION

In 1919, recorded exploration activity in the area began with the discovery of gold mineralization at Second Rapids, Claw Lake, central Cabot Township by Thomas Saville of Shining Tree, Ontario. These showings constituted the Rapids Vein and were located on the subsequent Porcupine-Kirkland Gold Mines Limited property. In 1922, Thomas Saville discovered gold and galena in veins on the central peninsula of Claw Lake and staked the Saville claim group to cover them. These claims were latter optioned to Ventures Limited who carried out extensive rock trenching. In 1925, Finley (Gledhill 1926) examined the geology of the showings. In 1929, Porcupine-Kirkland Gold Mines Limited did considerable surface work and some diamond drilling on their occurrences at the western end of Claw Lake. The veins in the central peninsula were again described in 1933 by Laird (Laird 1934). In 1946, Paymaster Consolidated Mines Limited drilled some of the veins in the area for Claw Lake Gold Mines Limited whose property included all the deposits. In 1960, Claw Lake Molybdenum Mines Limited examined some of the showings to assess their molybdenum content, and in 1965-66 carried out diamond drilling. Finally, in the period 1971-72, Canadian Johns-Manville Company Limited carried out geological, geophysical and geochemical work on the showings to determine whether the occurrences constituted an example of copper-molybdenum porphyry-type mineralization. No further exploration work was recorded for the area by December 31, 1975.

In 1957 and 1958, Paymaster Consolidated Mines Limited drilled five diamond drill holes in east central Kelvin Township for undisclosed reasons but discovered pyrite and graphite mineralization. This work was followed by further drilling in the area by Timiskaming Nickel Limited in 1967, who drilled four diamond drill holes, and encountered similar mineralization. In 1968, Huntec Limited and Lockwood Survey Corporation Limited carried out airborne electromagnetic and airborne magnetometer surveys in the area for Timiskaming Nickel Limited. The purpose of the survey was to detect massive sulphide deposits. Electromagnetic and magnetic anomalies were discovered, and in 1971, Canada Petroleum Company Limited drilled four diamond drill holes to test the airborne electromagnetic anomaly. Pyrite, graphite, copper, lead, zinc, and silver mineralization was encountered. In 1975, HBOG Mining Limited conducted a follow-up program of geophysical and geological work in the area, which lead to the discovery of four untested electromagnetic conductors. Three diamond drill holes were drilled to test the conductors and mineralization consisting of pyrite, graphite, copper, zinc, and lead was found. No further exploration work was carried out by December 31, 1975.

In 1960, Jonsmith Mines Limited discovered occurrences of chalcopyrite-bornite-magnetite-gold and, in some places, nickel in metavolcanics, metasediments, diorite, and gabbro in central Cabot Township. Thirteen packsack drill holes were drilled by the company in that year to evaluate the showings. In the next year, 1961, geological and geophysical surveys were done as well as pitting and trenching. During this time, silver-cobalt-nickel mineralization associated with copper, lead and zinc was discovered. In 1962, prospecting work was continued and was followed by diamond drilling in 1963. No further work was carried out on these showings by December 31, 1975.

In 1967, Scope Mining and Explorations Consultants Limited carried out ground magnetic and ground electromagnetic surveys at the middle part of the eastern boundary of Kelvin Township on the property of Talisman Mines Limited. The magnetic survey suggested the presence of diabase dikes and the electromagnetic survey responses obtained were considered to represent felsic-mafic volcanic contacts. No further work was carried out in the area by December 31, 1975.

In 1969, prospecting work was begun in southeastern Cabot Township. It consisted of trenching, rock sampling and geological mapping by Kennco Explorations (Canada) Limited for Elmer Galata, the owner of the property. This was followed in the next year, 1970, by geophysical work carried out by Geosearch Consultants for Kennco Explorations (Canada) Limited. No further exploration activity was recorded by December 31, 1975.

CHARACTER OF THE DEPOSITS

On the basis of company descriptions, geological mapping, and the examination of some of the occurrences by the author, it is believed that the deposits occurring in the map area can be considered to belong to: (1) the quartz monzonite-granodiorite-copper-molybdenum sulphide association, (2) the native silver-cobalt-nickel arsenide ores of "Cobalt" type, (3) the stratiform sulphides of marine and marine-volcanic association of Stanton (1972), and (4) copper-magnetite-gabbro mineralization.

QUARTZ MONZONITE-GRANODIORITE-COPPER-MOLYBDENUM SULPHIDE ASSOCIATION

This type of mineralization is exemplified by the deposits occurring on the Canadian Johns-Manville Company Limited (1) prospect and the Claw Lake Molybdenum Mines Limited (2) prospect. Although the copper assays are not high, the ore mineralogy of the veins and the host rocks indicate this type of mineralization.

NATIVE SILVER-COBALT-NICKEL ARSENIDE ORES ("COBALT" TYPE)

This type of deposit is believed to be represented by the deposits occurring in the southeastern part of the Johnsmith Mines Limited (7) property. During the current mapping by the author, the mineralization was observed to pass into the nearby north-northwesterly trending diabase dike. Dikes of this trend are generally referred to as Matachewan-type and regarded as Early Precambrian (Archean). However, mapping by the author in Fawcett and Leonard Township (Carter 1977, p.4) showed that dikes of similar trend and characteristics cut Cobalt Group rocks. Such dikes can be regarded as Nipissing-type, and, as silver-cobalt-nickel mineralization is associated with the Nipissing-type sills, it can also be associated with Nipissing-type dikes.

STRATIFORM SULPHIDES OF MARINE AND MARINE-VOLCANIC ASSOCIATION

The deposits occurring in the central part of the Jonsmith Mines Limited (7) property and the HBOG Mining Limited (9) property, and possibly on the Elmer Galata (5) property are included here. In the case of the Jonsmith Mines Limited deposit, it is considered that the occurrence represents the stringer-ore facies (Sangster 1972, p.12-14) of this type of mineralization. Current mapping by the author has led to the re-interpretation of the sediments of the company report as felsic tuff. The deposits of the HBOG Limited property, though uneconomic, are considered to represent the massive sulphide facies (Sangster 1972, p.11-12).

CHALCOPYRITE-MAGNETITE GABBRO MINERALIZATION

This type of mineralization occurs on the eastern part of the Jonsmith Mines Limited (7) property and the Falconbridge Nickel Mines Limited (4) property. In the case of the former, the diorite of the company report is interpreted by the author as metagabbro.

DESCRIPTION OF PROPERTIES, DEPOSITS, AND EXPLORED AREAS

CABOT TOWNSHIP

Canadian Johns-Manville Company Limited Prospect (1)

In the early part of 1975, Canadian Johns-Manville Company Limited held ten contiguous unsurveyed claims at Claw Lake in the south central part of Cabot Township. These were allowed to lapse in the latter part of the year. The claims included part of the nine claims originally staked by Thomas Saville in 1922; part of the 30 held by Claw Lake Gold Mines Limited in 1946; and part of the 37 held by Claw Lake Molybdenum Mines Limited in 1961.

In 1919 and 1920, The Rapids Vein was discovered at Second Rapids at the outlet of Claw Lake, by Thomas Saville.

In 1922, Thomas Saville discovered gold and galena in quartz veins in the central peninsula of Claw Lake and staked the Saville group of claims in that year to cover the showings. The claims were later optioned to Ventures Limited who carried out extensive rock trenching.

In 1925, Finley (Gledhill 1926) mapped Cabot Township and examined the Claw Lake showings.

In 1933, Laird (1934) carried out a geological examination of Cabot Township and described the Saville showings.

In 1946, Claw Lake Gold Mines Limited had Paymaster Consolidated Mines Limited drill 17 diamond drill holes for a total of 1590 m (5217 feet) on their Hillside Vein, their Galena Vein and the Rapids Vein. During this time the central part of the claim group was also mapped geologically by Claw Lake Gold Mines Limited.

In 1960, Claw Lake Molybdenum Mines Limited acquired the claims and in 1961 examined two of the molybdenite showings known as the West Vein and the Molybdenite Vein. In 1965-66 this company drilled five diamond drill holes for a total of 583 m (1916 feet) on the Galena Vein and the Molybdenite Vein.

During 1971-72, Canadian Johns-Manville Company Limited carried out geological mapping, magnetic and electromagnetic surveys, biogeochemical surveys and soil geochemical surveys, for the locating of copper-molybdenum porphyry-type mineralization. The geological survey located what was described as a granitic plug elongated in an east-west direction roughly parallel to the intruded volcanic rocks. The composition of the stock changes from "a diorite in the south, through granodiorite to a granite on the north contact" (Assessment Files, Ontario Ministry of Nothern Development and Mines (MNDM), Kirkland Lake). The volcanics on the north contact are cut "by swarms of quartz/feldspar porphyry dikes ...up to 20 feet wide...(which)...originated during the late stage period. It is in these late stage dikes that the original showings occur" (Assessment Files, MNDM, Kirkland Lake). The results of the geophysical surveys located weak conducting zones, but none was considered to warrant further exploration work. The biogeochemical surveys were carried out using birch, balsam and alders, and analyses were made for copper, molybdenum, lead, zinc, and silver. The purpose of the surveys was to determine whether the molybdenum showings were part of a copper-molybdenum, porphyry-type deposit. The results indicated only minor copper, molybdenum, silver, and lead mineralization. The overall results from the geological, geophysical and geochemical work indicated that the possibility of occurrence of a low-grade, copper-molybdenum deposit within the quartz-diorite plug was remote.

The exploration work carried out in the Claw Lake area was done on three showings known as: the Hillside Vein (Saville's No. 1 showing), the Galena Vein (Saville's No. 2 showing), and the Molybdenite Vein (Saville's No. 3 showing) (Figure 2). Mineralization consisted of gold, chalcopyrite, molybdenite, galena, silver, and pyrite. Early exploration activity was for the location of economic deposits of gold, but from 1961 activity was directed to the search for copper-molybdenum porphyry-type deposits.

The Hillside Vein (Saville's No. 1 Showing) was described by Laird (1934, p.68) as consisting of an "intricate stockwork of quartz stringers ranging in width from a fraction of an inch to several inches and cutting what appears to be a strongly granitized and sheared Keewatin tuff...close to the north margin of a diorite stock". The showing was exposed by exploration activity consisting of four north-south trenches across the strike. The showing was exposed for a length of "nearly 500 feet, and for widths as great as 250 feet" (Laird 1934, p.68). The strike of the veins is N70E and the dip is northerly. Vein breccia structure was observed, and a "series of three parallel quartz-feldspar porphyry dikes ranging from 2 to 15 feet in width (was seen to) cut across the showing in an east-west direction" (Laird 1934, p.68). The altered tuff is "strongly impregnated with fine iron pyrites, and locally the quartz carries notable quantities of molybdenite, specular hematite, and galena" (Laird 1934, p.68). No gold assays were recorded but gold values over suitable mining widths were reported to be low (Laird 1934, p.68). Sampling of an

unknown kind by Claw Lake Gold Mines Limited in 1946 returned a best assay of 0.79 oz. Au and 15.9 oz. Ag per ton over 76 cm (30 inches) for a length of 11 m (Assessment Files, MNDM, Kirkland Lake). Four diamond drill holes totalling 276 m (904 feet) were drilled for Claw Lake Gold Mines in 1946 by Paymaster Consolidated Mines Limited to test the showing. An assay of 0.01 oz. Au per ton over 137 cm was reported from a sampling point at a vertical depth of 34 m (110 feet) (Assessment Files, MNDM, Kirkland Lake).

The Galena Vein (Saville's No. 2 Showing), was originally described by Laird (1934, p.68) as consisting of "two parallel quartz veins striking east-west and dipping steeply south. The north vein is 16 inches wide, and the south one 10 inches wide" occurring "in a fresh-looking reddish granite". They were exposed in a north-south cribbed trench 30 feet in length" (Laird 1934, p.68). The quartz was said to be mineralized with pyrite, galena, molybdenite and chalcopyrite. Claw Lake Gold Mines Limited in 1947 described these veins as averaging 61 cm (24 inches) in width and lying 122 cm (48 inches) apart in a sheared and carbonatized porphyritic granite near its north contact with volcanics. Selected sampling of the veins carried out by Claw Lake Gold Mines Limited assayed 0.45 oz. Au per ton or higher (Assessment Files, MNDM, Kirkland Lake). Five diamond drill holes were drilled by Paymaster Consolidated Mines Limited for Claw Lake Gold Mines Limited for a total of 567 m (1862 feet) in 1946, and another diamond drill hole was drilled by Claw Lake Molybdenum Mines Limited in 1965 across the strike of the veins exposed in the pit. The highest assay obtained for gold was 0.05 oz. Au per ton over 91 cm (36 inches) at a depth of 47 m (154 feet) (Assessment Files, MNDM, Kirkland Lake). Molybdenite was encountered in some of the holes. The best assay from grab samples taken from dump material was 0.95 oz. Ag per ton and 0.57 oz. Au per ton as reported by Claw Lake Gold Mines in 1942 and 1947 respectively, and 0.21% MoS_2 as reported by Claw Lake Molybdenite Limited 1960 (Assessment Files, MNDM Kirkland Lake).

The Molybdenite Vein (Saville's No. 3 Showing), located at the northwest shore of the east arm of Claw Lake was originally described by Laird (1934, p.68) as "two parallel vertical quartz veins, each about 20 inches in width, which strike N70E...in a highly schisted quartz-feldspar porphyry". The showing which had been trenched by an unknown group in the summer of 1961 was re-examined by R.B. Graham for Claw Lake Molybdenum Mines Limited in November of 1961, who described it as consisting of a split vein 16 m (53 feet) long and varying from 0.5 to 2 m (1.5-6.8 feet) wide occurring in pink granite porphyry containing 5% muscovite. The strike of the vein is N70E and the dip is 76°N. The country rock is shattered, sheared, carbonatized and silicified in the vicinity of the vein. Mineralization in the south vein was described by Laird (1934, p.68) as being "an unusually heavy concentration of molybdenite and its yellow oxide, molybdite". The molybdenite "occurs both in the massive state and as thin films in tiny fractures in quartz" (Laird 1934, p.68). An assay of this material by the Provincial Assayer gave 0.74% MoS_2 (Laird 1934, p.68). Results from the assaying of grab samples of the split vein by Claw Lake Molybdenum Mines Limited as reported in 1960 was 0.96% MoS_2 and 0.07 oz. Au per ton (Assessment Files, MNDM, Kirkland Lake). The results of chip sampling by Claw Lake Molybdenum Mines Limited in 1961 was 0.27% MoS_2 and 0.05 oz. Au/ton over 0.55 m (1.8 feet) (Assessment Files, MNDM, Kirkland Lake). Three diamond drill holes were drilled on the showing during 1965-66, probably for Claw Lake Molybdenum Mines Limited. The best intersection from this drilling was a sludge sample yielding 0.36% MoS_2 over 3.1 m (10 feet) (Assessment Files, MNDM, Kirkland Lake).

Claw Lake Molybdenum Mines Limited Prospect (2)

In 1961, Claw Lake Molybdenum Mines Limited held 37 contiguous, unpatented claims at Claw Lake, in south central Cabot Township. These were not in good standing in 1975. The claims covered part of the property held by Porcupine-Kirkland Gold Mines Limited in 1933 (Laird 1934, p.69). The property included veins which came to be known as the Big Vein, the Draw Vein, the Rapids Vein, and the West Vein (Map 2470, back pocket). Mineralization consisted of gold,

chalcopyrite, molybdenite, galena, and pyrite. Early exploration work was carried out for location of economic deposits of gold, but from 1961 onwards this activity was undertaken to discover copper-molybdenum porphyry-type deposits.

In 1929, Porcupine-Kirkland Gold Mines Limited carried out considerable surface work and some diamond drilling on the Rapids Vein. The results of the work were reported to be "rather disappointing" (Laird 1934, p.69).

In 1946, Claw Lake Gold Mines Limited also diamond drilled the Rapids Vein.

In 1961, Claw Lake Molybdenum Mines Limited examined the West Vein.

The Big Vein is a quartz vein located 609.6 m (2000 feet) south-southwest of the Second Rapids at the western end of Claw Lake. It was traced for a length of 152 m (500 feet) and had a maximum width of 3.1 m (10 feet). Mineralization consisted of molybdenite, galena, and chalcopyrite but the vein material was assayed only for gold. The highest assay was 0.05 oz. Au per ton from an unknown kind of sampling done by Claw Lake Gold Mines Limited in 1946 (Assessment Files, MNDM, Kirkland Lake).

The Draw Vein is a quartz vein located 213 m (700 feet) north of the Big Vein. This vein was said to give consistent gold assay results from an unknown type of sampling, the assays averaging 0.13 oz. Au per ton over 46 cm (18 inches) for a length of 18 m (60 feet) as reported by Claw Lake Gold Mines Limited (Assessment Files, MNDM, Kirkland Lake).

The Rapids Vein is located at the western end of Claw Lake at the head of the portage. This vein was described in the company reports as having a complex structure due either to drag folding or to actually consist of several disconnected veins. The vein material is quartz and the veins strike N30W and dip 60°E. The inferred length of the vein is 152 m (500 feet) and it outcrops on both sides of the rapids. The best assay from an unknown type of surface sampling by Claw Lake Gold Mines Limited in 1946 was 0.58 oz. Au per ton across 46 cm (18 inches) (Assessment Files, MNDM, Kirkland Lake). Eight diamond drill holes totaling 7469 m (2451 feet) were drilled to test the vein system along a length of 122 m (400 feet) by Paymaster Consolidated Mines Limited in 1946 for Claw Lake Gold Mines Limited. The best intersection was 0.16 oz. Au per ton across 0.6 m (2 feet) (Assessment Files, MNDM, Kirkland Lake).

The West Vein is located at the confluence of the outlet streams from Claw Lake and Lucid Lake. The vein material was described as milky quartz in pink granitic quartz porphyry. The vein is exposed for a length of 42 m (138 feet), and varies in width from 0.4 to 1.7 m (1.3-5.5 feet). The strike of the vein is N10°E and the dip is 55°-67°E. Mineralization consists of fracture fillings and disseminations of molybdenite and pyrite. Chip sampling of this vein by Claw Lake Molybdenite Mines Limited in 1961 yielded a best assay of 1.21% MoS_2 over 0.55 m (1.8 feet), and a grab sample of the best material by the same company in 1960 recorded 1.39% MoS_2 (Assessment Files, MNDM, Kirkland Lake).

Doyon, P. (3)

In 1975, P. Doyon held one unpatented, unsurveyed claim L409858, which was in good standing on December 31, 1975.

No assessment work was filed for the property by December 1975, but it formed part of a claim group held by Jonsmith Mines Limited (7). No showings are located on the property, and current mapping shows it to be underlain by mafic and intermediate metavolcanics.

Falconbridge Nickel Mines Limited (4)

In 1975, Falconbridge Nickel Mines Limited held 12 contiguous, unpatented claims in central Cabot Township, numbered L413680-L413691 which were in good standing in December 1975.

No assessment work was filed by December 1975, but the property included some of the claims formerly held by Jonsmith Mines Limited (7). A total of 22 diamond drill holes for 1377 m (4717 feet) were drilled in 1963, 12 of which were

bored by Canadian Longyear Limited for Jonsmith Mines Limited, and the other ten apparently by Jonsmith Mines Limited itself. The aim of the drilling was not indicated, but it was carried out in an area underlain by gabbro as mapped by the author. Rocks described in the logs are gabbro and rhyolite, and mineralization consists of massive and disseminated chalcopyrite and pyrite in gabbro. No assay results were given in the company report.

Galata Occurrence (5)

In 1969, Elmer Galata held 12 contiguous, unpatented claims near the southeastern corner of Cabot Township. These claims were under option to Kennco Explorations (Canada) Limited in the summer of 1969. They were not in good standing in 1975.

During the summer of 1969, a program of trenching, prospecting, linecutting, rock sampling, and geological mapping was carried out by Kennco Explorations (Canada) Limited. This was followed in February 1970 by a geophysical (electromagnetic) survey carried out for Kennco Explorations (Canada) Limited by Geosearch Consultants Limited. The geological work consisted of the preparation of a detailed geological map at a scale of 1 inch to 400 feet. The property was described as being underlain by Precambrian rocks comprising volcanic rocks of the Keewatin Upper Group in Laird's terminology (Laird 1934, p.45, and p.47-48), and acidic and diabasic dikes. The volcanic rocks were described as consisting of relatively thick, massive felsite flows that are often pillowed, felsitic agglomerate, andesites, andesitic tuff and andesitic agglomerate. The acidic volcanics were said to be younger and to predominate in the southern half of the claim group, whereas the andesites were said to be more characteristic of the northern half of the property. The volcanic rocks are interlayered with meta-argillite and sericite schist. These rocks have an east-northeast strike and near-vertical dips. Major strike-faulting was described as occurring in the claim area. Current mapping by the author, however, has shown that the area is underlain predominantly by grey, pillowed, mafic metavolcanic rocks.

Mineralization was described as consisting of small occurrences of pyrite and chalcopyrite occurring mostly in felsitic rocks located in the centre of the property. "The main showings occur in the White Felsite which is inferred to be part of the final phase of a volcanic episode. Pyrite occurs very lightly disseminated in this unit where it is brecciated and fractured and intruded by Andesite. Chalcopyrite occurs in late fractures. The best assay was 0.1% Cu in 6.1 m (20 feet) of chip samples collected by T. Webster from the workings in the northeast corner of claim MR 213574" (Assessment Files, MNDM, Kirkland Lake).

The geophysical survey, by the Turam electromagnetic method, was carried out to locate possible near-surface, massive-sulphide mineralization in what had appeared to be a favourable geological environment. The results indicated that no significantly large bodies of massive-sulphide mineralization were present near the surface within the claim group. No further work was carried out on the property by December 31, 1975.

Irving, M.A., Estate (6)

In 1975, the M.A. Irving Estate held four contiguous, leased, surveyed claims in the southwestern part of Cabot Township.

No assessment work was filed for this property but current mapping by the author indicates that the area is underlain by intermediate metavolcanics and metagabbro.

Jonsmith Mines Limited Occurrences (7)

In 1962, Jonsmith Mines Limited held 45 contiguous, unpatented claims in central Cabot Township. These claims were not in good standing on December 31, 1975.

Exploration activity began on the property apparently in the summer of 1960 during which time prospectors for Jonsmith Mines Limited located several areas of mineralization in dioritic, mafic metavolcanic and metasedimentary rocks. During

the fall of 1960, the company drilled 13 packsack holes for a total of 3332.2 m (1094 feet). During the fall of 1961, the same company carried out geological and geophysical (magnetic and electromagnetic) surveys, and pitting and trenching on the property. This was followed by more prospecting work in the fall of 1962, and in the spring of 1963, 1439 m (4721 feet) of diamond drilling were drilled in 15 holes.

The geological work consisted of the preparation of a detailed geological map at a scale of 1 inch to 200 feet. The results of this work were described as follows: "The rocks on the property are largely Keewatin volcanics dipping very steeply to vertical and striking northeast-southwest and facing to the southeast. In the central part of the Jonsmith property is a band of sediments 3000 feet long and 300 feet wide conformable with the Keewatin volcanics in strike and dip. These sediments are composed of banded slate and greywacke with a thin band of conglomerate along their northwest edge. The sediments are thought to be Keewatin but might be Temiskaming preserved by the offset along a nearby strike fault. Small dikes of feldspar porphyry and basic diorite strike with the formation intruding both the volcanics and the sediments. Diabase dikes up to 150' wide are prominent on the property some of which are thought to be Matachewan in age and others Keweenawan. These dikes trend north-south with the exception of one east-west dike about 50' wide which is coarsely porphyritic showing yellow-green feldspar crystals up to 3" in length." (Company Report, Assessment Files, MNDM, Kirkland Lake). These sediments were re-interpreted by the author as tuffs and mapped as such.

Shearing and faulting were described on the property, and a major fault was believed to occur along the southern boundary of the sedimentary unit. Jointing was described as well developed in a northwest-southeasterly direction.

The results of the magnetometer survey indicated that all the high magnetic anomalies were indicative of diabase dike occurrences, except an anomaly associated with the sedimentary strata and adjacent volcanic rocks. This was due to magnetite associated with copper mineralization.

The electromagnetic survey did not reveal any conductors of significance, but isolated high readings were found to be useful in indicating possible mineralized areas and the extension of mineralized zones.

Three types of mineralization were found in three different areas of the property: (1) in the central area, (2) the east central area, and (3) the southeastern area.

Central Area

The showings in this area consisted of "massive chalcopyrite and bornite with associated magnetite in narrow occurrences following joint planes in and near the sedimentary band. These showings are accompanied by a dark chloritic alteration of the rock up to several feet in width with disseminated chalcopyrite. The copper occurrences follow northwest-southeast steep dipping joints and where jointing crosses northeast-southwest shearing, copper mineralization has penetrated the shearing for limited distances of a few feet. Coarse magnetite is present with the copper. Appreciable gold values have been obtained with the chalcopyrite..." (Assessment Files, MNDM, Kirkland Lake). Assay results from sampling of an unknown type returned values of "$2.00 to $3.00 per ton in gold with widths exceeding 50 feet assaying 35 (cents) to $1.05 per ton" (gold at $35.44 per oz. 1961 price) (Assessment Files, MNDM, Kirkland Lake).

Ten packsack holes were drilled in the fall of 1960 on these showings for a total of 287 m (941 feet) but ore grade was not established. In the spring of 1963 one diamond drill hole was drilled for a total of 305.7 m (1003 feet) to check for the extension of mineralization at a vertical depth of 213 m (700 feet) below the surface. Magnetite, pyrite and carbonatized rock were encountered between 192 and 243 m (630 and 798 feet), with gold assaying 0.02 oz. per ton over 0.4 m (1.3 feet) (Assessment Files, MNDM, Kirkland Lake). About 183 m (600 feet) northeast of these showings and on strike with it and the rocks mapped as sediments by the

company geologists a "Nickel bearing sulphide occurrence has been found in cross-fracturing in the sediments where massive pyrite shows in widths up to 12" and disseminated pyrite over widths of 4 feet. Values of 0.5% nickel over 4 feet and up to 2% nickel in selected samples have been obtained. Since no pyrrhotite is present the nickel is possibly in the form of the mineral millerite the nickel sulphide (NiS)." (Assessment Files, MNDM, Kirkland Lake). As mentioned above, the sediments have been mapped as tuffs by the author.

East Central Area

In the east central area, pitting and drilling were carried out on rocks mapped as diorite by the company. Three packsack drill holes were drilled on the occurrence for a total of 46.6 m (153 feet) in the fall of 1960. Mineralization consisted of chalcopyrite, galena and pyrite in quartz-calcite veins and stringers. Assays of 0.17% copper, 0.7% lead and 0.58 oz. Ag per ton over 0.46 m (1.5 feet) of core were obtained, with a best assay of 0.01 oz. Au per ton over 0.3 m (1.0 foot) of core (Assessment Files, MNDM, Kirkland Lake).

Southeastern Area

In the southeastern area, there occurs "a quartz calcite vein ...striking northwest-southeast in Keewatin lava and dipping 50° to the southwest. The vein varies in width from 3 inches to 24 inches and carries massive cobalt mineralization with the presence of native silver. The vein has been exposed for a length of 90 feet...(and)...shows a width of 16 inches of quartz-calcite filling in a breccia zone....In addition to the presence of cobalt minerals and native silver in the vein some nicolite and minor amounts of chalcopyrite and galena are found." (Assessment Files, MNDM, Kirkland Lake). The vein was described as "a typical Cobalt-Gowganda Type silver vein" (Assessment Files, MNDM, Kirkland Lake). A sample of unknown type taken by Jonsmith Mines Limited from the breccia zone returned an assay of 44.45 oz. Ag per ton and another such sample 0.005 oz. Au per ton. A grab sample of massive cobalt mineralization from the vein returned 5.89% Co and 0.32% Ni (Assessment Files, MNDM, Kirkland Lake). For a distance of 45.7 m (150 feet) northeast and southwest of this vein, copper-lead-zinc mineralization occurring as massive chalcopyrite and sphalerite associated with galena, pyrrhotite and pyrite occur mainly "as joint fillings in amygdaloidal lava with some replacement sulphides in the wall rock near the jointing." (Assessment Files, MNDM, Kirkland Lake). No magnetite or gold was present, but low silver values were associated with the mineralization. Where exposed it was stated that there were insufficient sulphides to constitute ore. Thirteen diamond drill holes totalling 1056 m (3465 feet) were drilled in 1963 by Canadian Longyear Limited for Jonsmith Mines Limited to assess the showing. One additional diamond drill hole was drilled by the same company in 1963, 152 m (500 feet) southeast of and on strike with the vein, for a depth of 207 m (681 feet) to check its southeasterly extension.

Larche, J.P. (8)

In 1975, John P. Larche held 11 contiguous, unpatented claims at the central part of the northern boundary of Cabot Township. These were numbered L 442806 to L 442816, and formed part of the New Lorie Mines Limited property, held by the latter in 1963.

In the fall of 1963, the property was examined by L.G. Phelan, Consulting Geologist who observed outcrops of intermediate flows trending northeasterly and dipping steeply. The consulting geologist believed that rhyolites and greywacke, observed to the west of the property, also extended across the southerly part of the claim group. Current mapping by the author has not verified this.

No further work was carried out on the property by December 31, 1975.

KELVIN TOWNSHIP

HBOG Mining Limited (9)

In 1975, HBOG Mining Limited held 21 contiguous unpatented claims in east central Kelvin Township. The claims were in good standing on December 31, 1975. The property formed part of a claim group formerly held by Paymaster Consolidated Mines Limited in 1957, and part of a claim group previously held by Timiskaming Nickel Limited in 1971, none of which was in good standing as of December 31, 1975.

During the fall of 1957 and the spring of 1958, Paymaster Consolidated Mines Limited drilled five diamond drillholes for 702 m (2303 feet) at the head of Bigfour Creek, 1 mile west of the Grassy River Road. Breccia with "chicken-track" (spinifex) texture, felsic metavolcanics, granitic and dioritic dikes, fuchsite, carbonate, and much graphite and graphitic schist were encountered in the drilling. Mineralization consisted of graphite and pyrite. The best assay, which was obtained from a grey breccia, returned values of 0.02 oz. Au/ton, and 0.1% nickel over 1.5 m (5 feet) (Assessment Files, MNDM, Kirkland Lake).

In the fall of 1967, Timiskaming Nickel Limited drilled four diamond drill holes for a total of 664 m (2179 feet), 0.4 km (1/4 mile) west of the lake at the head of Bigfour Creek located 0.8 km (1/2 mile) west of the Grassy River Road. Felsic fragmental volcanic rocks, graphitic schist, "hen-track" (spinifex-textured) tuff, and "deckerite" (ultramafic breccia) were intersected in the core. Mineralization was found to consist of nodular pyrite in graphitic schist.

In the fall of 1968, Huntec Limited and Lockwood Survey Corporation Limited carried out airborne electromagnetic and airborne magnetometer surveys for Timiskaming Nickel Limited over the latter's property in the eastern part of Kelvin Township. The electromagnetic system used was "sensitive to large bodies at a depth of up to 250 feet below the bird" (Assessment Files, MNDM, Kirkland Lake). An electromagnetic anomaly was located on the property having a north-northeasterly trend and lying within 0.4 km (1/4 mile) of the headwater lakes of Bigfour Creek, 1.6 km (1 mile) west of the Grassy Road. The southern part of the anomaly coincided with a reach of Bigfour Creek. The anomaly was considered to merit further consideration and a follow-up ground electromagnetic survey was recommended to locate the anomaly more accurately on the ground. It was also recommended that the area be examined to determine whether the anomaly was due to the presence of graphite, non-economic minerals, or man-made structures. Previous drilling in the area by Paymaster Consolidated Mines Limited in 1957 and 1958, and Timiskaming Nickel Limited in 1967, had revealed the presence of graphite and graphitic schists in the electromagnetic anomaly area, and mapping by the author shows that the area is underlain by intermediate metavolcanic rocks and ultramafic rocks. The magnetometer survey showed considerable magnetic relief in an area 0.8 km (1/2 mile) to the northwest of Michiwakenda Lake. It was felt that this would be consistent with a change to a more basic suite of rocks. However, mapping by the author shows that this area is underlain by intermediate metavolcanic rocks, metasediments, and northwesterly-trending diabase dikes. It is the author's opinion that the enhanced magnetic relief in this area is due to the presence of the diabase dikes which are magnetic.

In 1971, Canada Petroleum Company Limited drilled four diamond drill holes for 606 m (1989 feet) in the vicinity of the electromagnetic anomaly described above. Rocks encountered in the drilling were described as felsic and dacitic agglomerate and argillite. Mineralization was reported to consist of considerable graphite and much pyrite. The best copper assay was 0.07% copper over 1.5 m (5 feet) of dacitic agglomerate. The best assays for lead and zinc were 0.01% lead and 0.32% zinc over 1.5 m (5 feet) of pyritic graphite core containing calcite veins. The best silver assay was 0.06 oz. Ag per ton over 1.4 m (4.7 feet) from graphitic material. Gold values obtained were all in trace amounts (Assessment Files, MNDM, Kirkland Lake).

In the summer of 1975, HBOG Mining Limited conducted a follow-up program of ground geophysical and geological investigations along the area of the airborne

electromagnetic anomaly. This survey resulted in the discovery of four previously untested electromagnetic conductors coincident with the airborne conductor. Three diamond drill holes were proposed to test the conductors but in fact four such holes were drilled in the fall of 1975. Rocks encountered in the drilling were gabbro, sediments, graphitic sediments, talc schist, felsic tuff, and breccia. Mineralization consisted of considerable amounts of pyrite and graphite which form conductive zones. The best assay results for base metals from semi-quantitative determinations were: 0.05-0.5% Cu over 2 m (7 feet), less than 0.01% Pb over 0.76 m (2.5 feet), 0.01-1.0% Zn over 2 m (7 feet), and trace amounts of Ni. Silver and gold, as determined by fire assay, were in trace amounts (Assessment Files, MNDM, Kirkland Lake).

No further exploration work was recorded for this area by December 31, 1975.

Talisman Mines Limited [1967] (10)

In 1967, Talisman Mines Limited held 27 contiguous, unpatented claims along the central part of the common boundary between Kelvin and Natal Townships. The claims were not in good standing by December 31, 1975.

In 1967, Scope Mining and Explorations Consultants Limited carried out ground magnetic and ground electromagnetic surveys over the claim group for the owners, Talisman Mines Limited. The results of the magnetic survey suggested the presence of diabase dikes, and the electromagnetic responses were believed to represent contacts between felsic and mafic metavolcanic rocks.

No further work was carried out on the property by December 31, 1975.

RECOMMENDATIONS FOR FUTURE MINERAL EXPLORATION

Recent geological mapping, examination of some of the mineral deposits in the map area, and the detailed description of deposits by mining companies indicate that: porphyry-type copper-molybdenum-gold-silver mineralization, Cobalt-type silver-cobalt-nickel, massive-sulphide volcanogenic copper lead-zinc, and copper-magnetite gabbro mineralization occur in the map area.

As the Claw Lake Stock is the only granitic stock in the map area, and as it is also made up of the only granitic rocks containing copper-molybdenum mineralization, any such economic copper-molybdenum potential in the area is essentially focused on the Claw Lake Stock. Recommendation for further mineral exploration for molybdenum and copper in this setting is thus restricted to this stock.

The search for massive sulphide base metal deposits of volcanogenic affinity would require further prospecting of the Jonsmith Mines Limited (7), and especially the HBOG Mining Limited (9) deposits. In the northwestern part of Cabot Township, a contact between a wide rhyolite unit and basaltic rocks is interpreted by the author to be the junction of two volcanic cycles on the basis of geological information in Cabot Township and Burrows Township to the north. It is recommended that the contact zone be prospected for massive sulphide deposits. As much of the contact is drift covered, the region should be prospected geophysically by airborne electromagnetic surveys before ground prospecting is undertaken. In the central part of Cabot Township, coarse intermediate pyroclastic rocks were mapped and they form a distinctive unit. Although no base metal mineralization was found, this region of the township outlined by the unit should be prospected for similar mineralization.

Precious metal gold-silver mineralization occurs associated with copper-molybdenum mineralization in the Claw Lake Stock. This stock has been fairly thoroughly prospected and it does not appear that new discoveries would be easily found.

Cobalt-type silver-cobalt deposits occur associated with north-northwesterly trending diabase dikes in central Cabot Township. These diabase dikes should be prospected first where they show hydrothermal alteration, before extending the search into other parts of the area, where similar dikes occur.

Copper-iron mineralization occurs in gabbroic and metagabbroic units in central Cabot Township. These units resemble other such bodies mapped in the northern and southwestern parts of Cabot Township and in northeastern and south central Kelvin Township, but no surface mineralization was observed in these other bodies during this survey.

REFERENCES

Ayres, L.D.
1972: Guide to Rock Nomenclature Used in Reports of the Ontario Division of Mines, Ontario Division of Mines Miscellaneous Paper 52, 14p.

Boissonneau, A.N.
1965: Surficial Geology: Algoma, Sudbury, Timiskaming and Nipissing. Map S465, scale 1:506 880 or 8 miles to 1 inch. Ontario Department of Lands and Forests.

Carter, M.W.
1977a: Geology of Fawcett and Leonard Townships, Districts of Sudbury and Timiskaming; Ontario Division of Mines, GR 146, 50p. Accompanied by Map 2359, scale 1:31 680 or 1 inch to 1/2 mile.

Carter, M.W.
1977b: Geology of Macmurchy and Tyrrell Townships, Districts of Sudbury and Timiskaming; Ontario Division of Mines, GR 152, 69p. Accompanied by Map 2365, scale 1:31 680 or 1 inch to 1/2 mile.
1980: Geology of Connaught and Churchill Townships, District of Sudbury; Ontario Geological Survey Report 190, 81p. Accompanied by Geological Map 2414, scale 1:31 680 or 1 inch to 1/2 mile.

Coleman, A.P.
1901: Iron Ranges of the Lower Huronian; Ontario Bureau of Mines, Volume 10, p.182.

Fahrig, W.F., Gaucher, E.M., and Larochelle, A.
1965: Paleomagnetism of Diabase Dikes of the Canadian Shield; Canadian Journal of Earth Sciences, Volume 2, p.278-298.

Gledhill, T.L.
1926: Notes on the South Part of the Grassy River Area; Ontario Department of Mines, Volume 35, Part 6, p.77-82 (published 1927). Accompanied by Map 35j, scale 1 inch to 1/2 mile.

Irvine, T.N. and Baragar, W.R.A.
1971: A Guide to the Chemical Classification of the Common Volcanic Rocks; Canadian Journal of Earth Sciences, Volume 8, p.523-548.

Jensen, L.S.
1976: A New Cation Plot for Classifying Subalkalic Volcanic Rocks; Ontario Division of Mines, Miscellaneous Paper 66, 22p.

Laird, H.C.
1934: Geology of the Makwa-Churchill Area; Ontario Department of Mines, Volume 43, Part 3, p.37-80 (published 1935). Accompanied by Map 43c, scale 1 inch to 1 mile.

MacDonald, G.A.
1968: Composition and Origin of Hawaiian Lavas; Geological Society of America, Memoir 116, p.477-522.

Parks, W.A.
1900: Niven's Base Line, 1899; Ontario Bureau of Mines, Volume 9, p.127, 141. Accompanied by unnumbered map, scale 1 inch to 8 miles.

Sangster, D.F.
1972: Precambrian Volcanogenic Massive Sulphide Deposits in Canada: A Review; Geological Survey of Canada, Department of Energy, Mines and Resources, Paper 72-22, 44p.

Stanton, R.L.
1972: Ore petrology; McGraw-Hill Book Company, New York, 713p.

Yoder, H.S. and Tilley, C.E.
1962: Origin of Basalt Magmas: An Experimental Study of Natural and Synthetic Rock Systems; Journal of Petrology, 3, p.342-532.

Index

Aeromagnetic texture 36
Aggregate polarization 13
Airborne electromagnetic anomaly 37
Amygdaloidal flows 18
Amygdaloidal textures 6,12
Amygdules 16,17,18
Anomalies:
  Airborne electromagnetic 37
  Electromagnetic 45,46
  Geophysical 37
  Magnetic 43
Argillite, current ripple marks 25
Aureoles, granitic rock 13
Autoclasts 11

"Big Vein" 40,41
Bigfour Creek 4,45
Bigfour Lake block 35
Biogeochemical surveys 39
Bombs 16,20,21,25
Bornite 43
Breccia zone 44
Breccias, pillow 20

Cabot Lake 34
Canada Petroleum Co. Ltd. 37,45
Canadian Johns-Manville Co. Ltd. 37-39
Canadian Longyear Ltd. 42
Carbonatized rock 43
Cataclastic texture 11
Chalcopyrite 43
  Mineralization 39,40,41,42,44
Chalcopyrite-bornite-magnetite-gold occurrences 37
Chilled margin effects 6
Chromite 10,11
Chromium in basaltic komatiite 12
Claw Creek 4
Claw Lake 4,6,16,20,25,27,35,37-41
Claw Lake block 35
Claw Lake Gold Mines Ltd. 37-41
Claw Lake Molybdenum Mines Ltd. 37-41
Claw Lake showings 39
Claw Lake Stock 6,27,29-31,47
  Aeromagnetic high 36
Cobalt 44
Cobalt-Gowganda type silver vein 44
Cobalt-type silver-cobalt-nickel mineralization 47
Colour index:
  Buff-coloured porphyries 31
  Leucocratic diabase 33
  Leucogranodiorite 29
  Massive diabases 31
  Trondhjemite 31
Contact zone 47
Contact, granite/metavolcanics 35
Copper 45
  Mineralization 37,39
Copper-lead-zinc mineralization 44
Copper-magnetite mineralization 47
Copper-molybdenum porphyry-type mineralization 37,41
Copper-molybdenum-gold-silver mineralization 47
Cross-fracturing 44
Current ripple marks in argillite 25

"Deckerite" 45
Diabase dike trends 36
Diamond drill holes 39,40,41,43-46
Diamond drilling 37,41
Dikes:
  Keweenawan diabase 43
  Matachewan diabase 43
  Nipissing-type diabase 38
"Draw Vein" 40,41

Electromagnetic anomaly 45,46
Electromagnetic conductors 37,46
Electromagnetic survey 42
Elephant Head Creek 35
Elephant Head Lake 35
Elephant Head Lake Fault 35
Epidote, ptygmatic veins 17
Esker 34
  Complex 4

Falconbridge Nickel Mines Ltd. 38,41
Fault-trend direction 36
Faulted contact 27
Feldspar phenocrysts, flow alignment 21
Flame structures 6

Flow alignment, feldspar phenocrysts 21
Flows:
Amygdaloidal 18
Pillowed 18
Fuchsite 45

Galata, Elmer 37,38,42
Galena 37,39
Mineralization 40,41,44
"Vein" 39,40
Geological surveys 37
Geophysical anomalies 37
Geophysical surveys 37,39,43,45,46
Turam electromagnetic method 42
Geosearch Consultants Ltd. 37,42
Glacial outwash deposits 34
Glaciofluvial esker deposits 34
Gogama 4
Gold 39,41,43,45,46
Mineralization 37,40
Gold-silver mineralization 47
Graded bedded tuff-chert 20
Graded bedding 6
Graham, R.B. 40
Granite/metavolcanics contact 35
Granitic rock aureoles 13
Graphite 45,46
Mineralization 37
Graphitic schist 45
Grassy Lake 35
Grassy Lake Fault 35,36
Grassy River Road 45
Grassy Road 45
Gravel 34
Gravity fault 35
Ground moraine deposits 34

HBOG Mining Ltd. 37,38,45,47
Hematite staining 29
"Hillside Vein" 39
Huntec Ltd. 37,45
Hydro line 4

Intersertal texture 16
Irving, M.A., Estate 42

Jonsmith Mines Ltd. .. 37,38,41,42,44,47
Jonsmith property 43

Keewatin lava 44
Keewatin Upper Group 42
Keewatin volcanics 43
Kelvin Creek 4
Kelvin Lake 35
Kelvin Lake Fault 6,16,35,36
Kennco Explorations (Canada) Ltd. 37,42
Ketchiwaboose Lake 33,35
Ketchiwaboose Lake Fault 35,36

Larche, John P. 44
Lead 45
Mineralization 37,39
Load casts 6
Lockwood Survey Corp. Ltd. 37,45
Lucid Lake 41

Macfie Lake 12,16
Magnetic anomalies 43
Magnetite 43
Marne Creek 4
Massive sulphide facies 38
Massive-sulphide volcanogenic copper lead-zinc mineralization 47
Mattagami Lake 4,16
Metasomatic phenocrysts, microcline 6
Michiwakenda Lake 4,45
Millerite 44
Mineralization:
Chalcopyrite 39,40,41,42,44
Cobalt 44
Cobalt-type silver-cobalt-nickel 47
Copper 37,39
Copper-lead-zinc 44
Copper-magnetite 47
Copper-molybdenum porphyry-type 37
Copper-molybdenum-gold-silver 47
Galena 40,41,44
Gold 37,40
Gold-silver 47
Graphite 37
Lead 37,39
Massive-sulphide volcanogenic copper-lead-zinc 47
Molybdenite 39,40,41
Pyrite 37,39-42,44
Silver 37,39
Silver-cobalt-nickel 37
Zinc 37
Molybdenite mineralization 39,40,41
Molybdenite showings 39
"Molybdenite Vein" 39,40

Molybdenum 37,39
Mylonitic texture 11

New Lorie Mines Ltd. 44
Nickel 37,44,45
  Basaltic komatiite 12
Nicolite 44
Nipissing-type diabase dikes 38

Occurrences, chalcopyrite-bornite-magnetite-gold 37
Okawakenda Lake 4

Paymaster Consolidated Mines Ltd. 37,39,40,41,45
Phelan, L.G. 44
Photolineament 35
Pillows 15,16
  Breccia 16,20
  Flows 18
  Fragmented 20
Pilotaxitic texture 16
Pitting 37,43,44
Porcupine-Kirkland Gold Mines Ltd. 37,40,41
Prospecting 37,42,43
Pyrite 21,44-46
  Mineralization 37,39-42,44
Pyrrhotite 44

Quartz, undulose extinction 31

"Rapids Vein" 37-41
Rock sampling 42
Rock trenching 37

Sand deposits 34
Sand dunes 4,34
Sand plains 4,34
Saville Group 39
Saville, Thomas 37-39
Schist, graphitic 45
Scope Mining and Explorations Consultants Ltd. 37,46
Second Rapids 37,38,41
Shearing 43
Silver 44-46
  Mineralization 37,39
Silver-cobalt-nickel mineralization 37
Soil geochemical surveys 39
Sphalerite 44
Spinifex 6
  Texture 10,12
Stringer-ore facies 38
Sudbury dike swarm 34
Sulphide mineralization . 37-39,44,45,47
  Bornite 43
  Chalcopyrite 39-44
  Galena 37,39-41,44
  Millerite 44
  Molybdenite 39-41
  Pyrite 21,37,39-42,44
  Pyrrhotite 44
  Sphalerite 44
Surveys:
  Airborne electromagnetic 37
  Airborne magnetometer 37
  Biogeochemical 39
  Electromagnetic 42
  Geochemical, soil 39
  Geological 37
  Geophysical 37,39,43,45,46
Synclinal axis 35
Synclinorium 6

Talisman Mines Ltd. 37,45
Texture:
  Aeromagnetic 36
  Amygdaloidal 6,12
  Cataclastic 11
  "Chicken-track" [spinifex] 45
  Intersertal 16
  Mylonitic 11
  Pilotaxitic 16
  Spinifex 10,12,45
  Variolitic 6
Timiskaming Nickel Ltd. 37,45
Togo Batholith 6,27,36
Trenches 39,40
Trenching 37,39,42,43
Tuff-chert, graded bedded 20
Turam electromagnetic method, geophysical survey 42

Undulose extinction of quartz 31
Upfaulted block 35

Varioles 11,16
Variolitic serpentine 11
Variolitic textures 6
Vein breccia structure 39
Ventures Ltd. 37,39
Volcanic cycles 47

Webster, T. 42
"West Vein" 39,40

Zinc 45
Mineralization 37

Ministry of Natural Resources
Ontario

LEGEND

PHANEROZOIC

CENOZOIC[a]

QUATERNARY

PLEISTOCENE AND RECENT

Sand, gravel, swamp and alluvial deposits

UNCONFORMITY

PRECAMBRIAN[b]

EARLY TO LATE PRECAMBRIAN

MAFIC INTRUSIVE ROCKS

ALKALIC DIABASE DIKES

9 Unsubdivided.
9a Porphyritic diabase.
9b Leucocratic diabase.

INTRUSIVE CONTACT

THOLEIITIC DIABASE DIKES

8 Unsubdivided.
8a Diabase.
8b Diabase, with pink feldspar.
8c Porphyritic diabase.
8d Leucocratic diabase.

INTRUSIVE CONTACT

EARLY PRECAMBRIAN

FELSIC INTRUSIVE ROCKS

7a Biotite granodiorite.
7b Porphyritic biotite granodiorite.
7c Aplite.
7d Leucogranodiorite.
7e Porphyry.
7f Porphyry, with quartz and / or feldspar phenocrysts.
7g Biotite trondhjemite.
7h Quartz diorite.

INTRUSIVE CONTACT

METAMORPHOSED MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS

6a Quartz gabbro, gabbro.
6b Olivine gabbro.
6c Serpentinite.

INTRUSIVE CONTACT

METAVOLCANICS AND METASEDIMENTS

METASEDIMENTS

5 Unsubdivided.
5a Wacke-chert.
5b Wacke, banded.
5c Wacke.
5d Chert.
5e Argillite-chert.
5f Argillite.
5g Hematite-chert ironstone.

METAVOLCANICS

FELSIC METAVOLCANICS

4 Unsubdivided.
4a Aphanitic flows.
4b Porphyritic flows.
4c Foliated flows.
4d Agglomerate.
4e Lapilli tuff.

81°25'
81°20'
47°45'
BURROWS
CABOT
TOGO
Robbie Lake
Macfie Lake
Ketchiwaboose Lake
Ketchiwaboose Lake
Cabot Lake
Little Claw Lake
Claw Creek
Marne Lake
Creek
Togo
Batholith
Electric Power Transmission Line
T3-1b
T4-9
T6-10
T6-3
V1-1a,b
V2-7a
V2-5
V4-1
Molybdenite Vein
Mo, Au
Galena Vein
Pits
Trench
DH
Cu, Au
Cu, Zn, Pb
Co, Ni, Pb, Cu, Zn
Cu, Zn
Cu, Ag
Au, Ag

Ministry of Natural Resources

Ontario

81°25'

81°20'

81°15'

BURROWS

CABOT

KEMP

KELVIN

Robbie Lake

Macfie Lake

Cabot Lake

Little Claw Lake

Claw Creek

Marne Lake

Marne Creek

Kelvin Lake

Kelvin Creek

Kelvin Fault

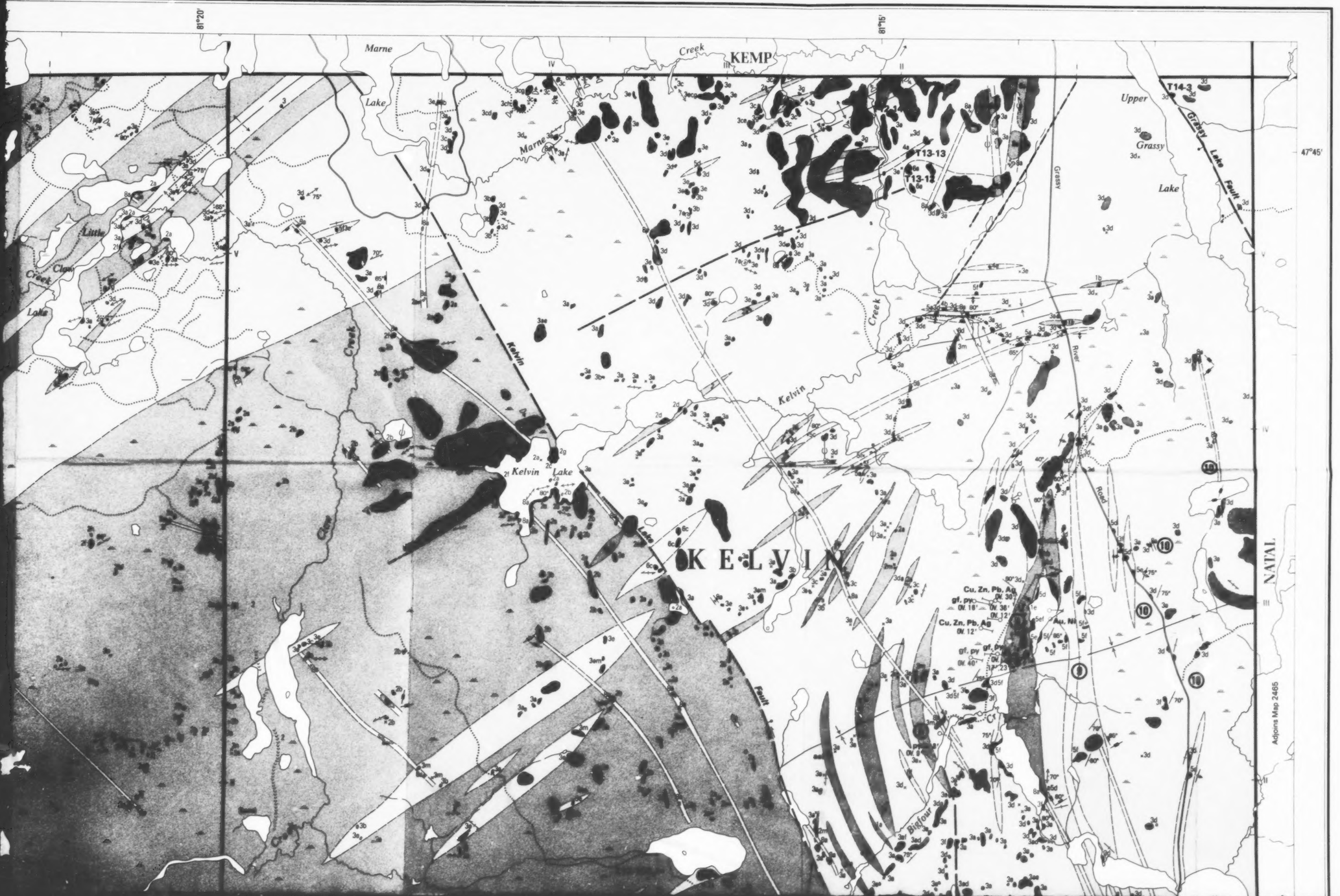
Molybdenite Vein Mo, Au

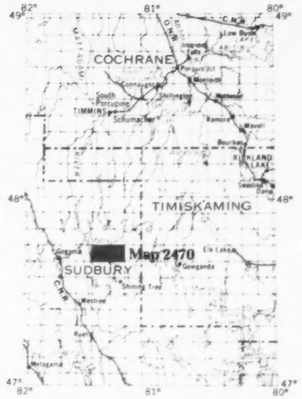
Hillside Vein

Lucid Lake

Ministry of Natural Resources
Ontario

Ontario Geological Survey
Map 2470
Cabot and Kelvin Townships





Scale 1 inch to 50 miles
N.T.S. Reference 41P/11, 41P/14

SYMBOLS

- *Glacial striae. Glacial fluting or drumlin.*
- *Esker.*
- *Bedrock; (small outcrop, area of outcrop).*
- *Bedding, horizontal.*
- *Bedding, top unknown; (inclined, vertical).*
- *Bedding, top indicated by arrow; (inclined, vertical, overturned).*
- *Bedding, top (arrow) from grain gradation; (inclined, vertical, overturned).*
- *Bedding, top (arrow) from cross bedding; (inclined, vertical, overturned).*
- *Bedding, top (arrow) from relationship of cleavage and bedding; (inclined, overturned).*
- *Lava flow; top (arrow) from pillows shape and packing. Lava flow; top in direction of arrow.*
- *Direction of paleocurrent.*
- *Schistosity; (horizontal, inclined, vertical).*
- *Gneissosity; (horizontal, inclined, vertical).*
- *Foliation; (horizontal, inclined, vertical).*
- *Banding; (horizontal, inclined,*

METAMORPHOSED MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS

6a Quartz gabbro, gabbro
6b Olivine gabbro
6c Serpentinite

INTRUSIVE CONTACT

METAVOLCANICS AND METASEDIMENTS

METASEDIMENTS

5 Unsubdivided.
5a Wacke-chert.
5b Wacke, banded.
5c Wacke.
5d Chert.
5e Argillite-chert.
5f Argillite.
5g Hematite-chert ironstone.

METAVOLCANICS

FELSIC METAVOLCANICS

4 Unsubdivided.
4a Aphanitic flows.
4b Porphyritic flows.
4c Foliated flows.
4d Agglomerate.
4e Lapilli tuff.
4f Tuff.

INTERMEDIATE METAVOLCANICS

3 Unsubdivided.
3a Aphanitic flows.
3b Porphyritic flows.
3c Pillowed flows.
3d Tuff.
3e Lapilli tuff.
3f Tuff-chert.
3g Pillow breccia.
3h Amygdaloidal flows.
3j Tuff-breccia.
3k Medium to coarse-grained flows.
3m Agglomerate.
3n Flows with quartz amygdules.

MAFIC METAVOLCANICS

2 Unsubdivided.
2a Flows, aphanitic.
2b Porphyritic flows (feldspar phenocrysts).
2c Pillowed flows.
2d Medium to coarse-grained flows.
2e Pillow breccia.
2f Amygdaloidal flows.
2g Agglomerate.
2h Lapilli tuff.
2j Tuff-breccia.
2k Variolitic flows.
2m Light-grey flows.
2n Tuff.

ULTRAMAFIC METAVOLCANICS

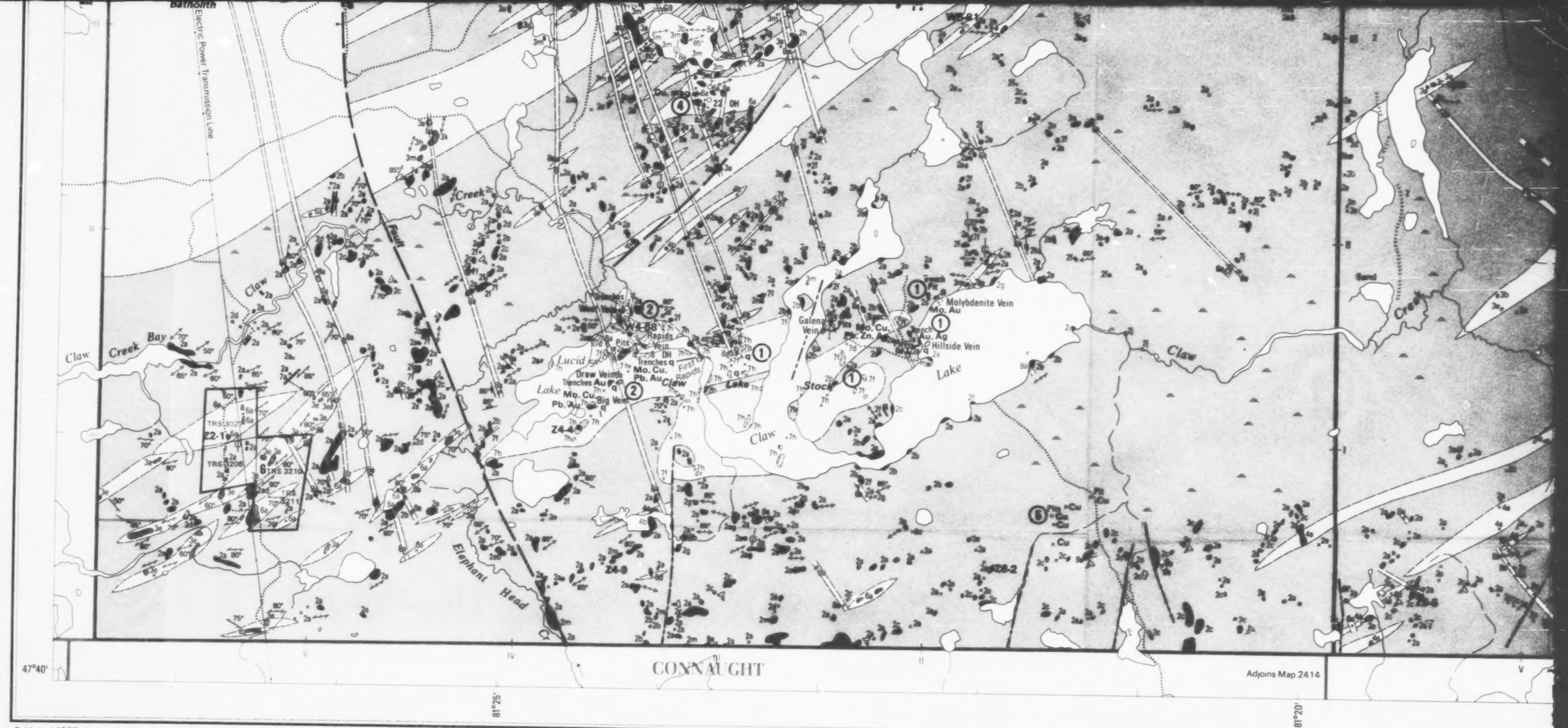
1a Serpentinite.
1b Green carbonate rock.
1c Yellow carbonate rock.
1d Serpentinite breccia.
1e Variolitic serpentinite.

Ag	Silver.
asb	Asbestos.
Au	Gold.
Co	Cobalt.
Cu	Copper.
gf	Graphite.
mag	Magnetite.
Mo	Molybdenum.
Ni	Nickel.
Pb	Lead.
py	Pyrite.
qc	Quartz carbonate.
q	Quartz.
Zn	Zinc.

[a] Unconsolidated deposits. Cenozoic deposits are represented by the lighter and uncoloured parts of the map.

[b] Bedrock geology. Outcrops and inferred extensions of each rock map unit are shown respectively in deep and light tones of the same colour. Where in places a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.

The letter "G" preceding a rock unit number, for example "G8" indicates interpretation from geo-physical data in drift covered areas.



Published 1983

SOURCES OF INFORMATION

Geology by M.W. Carter and assistants, Geological Branch, 1975. Geology is not tied to surveyed lines.

Assessment work files, O.D.M. Resident Geologists' Office, Kirkland Lake.

ODM - GSC Aeromagnetic maps 285G and 286G, Aeromagnetic map 7076G Geological Survey of Canada.

Ministry of Natural Resources (O.D.M.), map 35j, 43c, and 2205.

Preliminary maps (O.D.M.) P.1104, Cabot Township, and P.1105 Kelvin Township, issued in 1976, scale 1 inch to 1/4 mile, and P.151.

Cartography by D.G. James and assistants, Surveys and Mapping Branch 1983.

Base map derived from maps of the Forest Resources Inventory, Surveys and Mapping Branch.

Magnetic declination in the area was approximately 9° West, 1980.

Parts of this publication may be quoted if credit is given. It is recommended that reference to this map be made in the following form:

Carter, M.W.
1983: Cabot and Kelvin Townships; Ontario Geological Survey Map 2470, Precambrian Geology Series, Scale 1 inch to 1/2 mile, geology 1975.

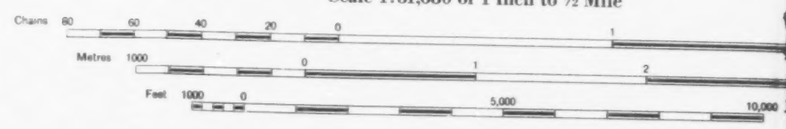
Ontario Geological Survey

Map 2470

CABOT AND KELVIN TOWNSHIPS

SUDBURY DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile



Ontario Geological Survey

Map 2470

CABOT AND KELVIN TOWNSHIPS

SUDBURY DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles

Metres 1000 0 1 2 3 Kilometres

Feet 1000 0 5,000 10,000 Feet

CONNAUGHT

Adjoins Map 2414

CHURCHILL

To Hwy. 560

81°20'

81°15'

PROPERTIES, MINERAL DEPOSI

CABOT TOWNSHIP

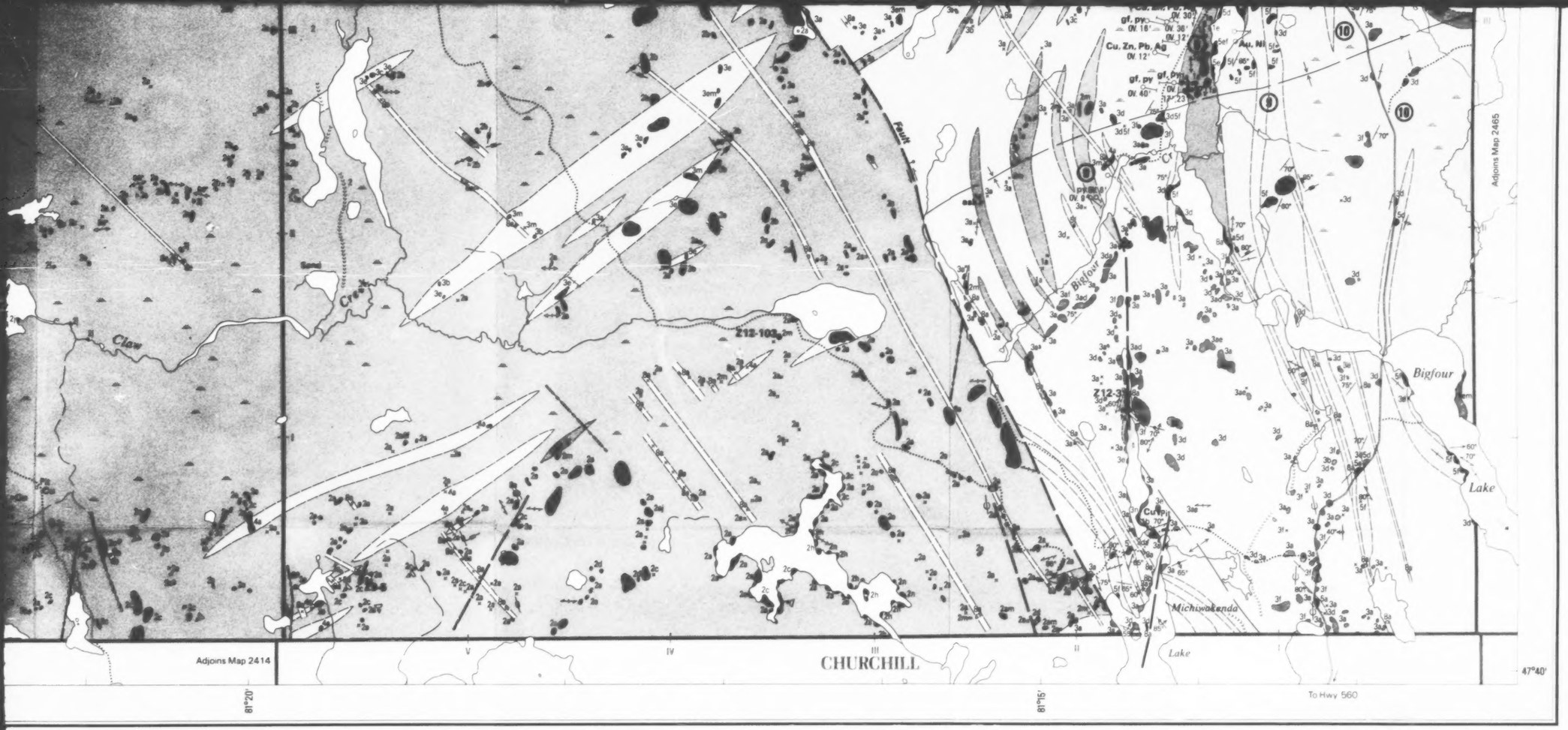
1. Canadian Johns-Manville Company Prospect
2. Claw Lake Molybdenum Mines Prospect
3. Doyon, P.
4. Falconbridge Nickel Mines Limited
5. Galata Occurrence
6. Irving, M.A., Estate.
7. Johnsmith Mines Limited Occurrences
8. Larche, J.P.

KELVIN TOWNSHIP

9. HBOG Mining Limited.
10. Talisman Mines Limited [1967].

Information current to December 31st, 197

Only former properties on ground now staking are shown where exploration info available — a date in square brackets ind year of exploration activity. For further i see report.



Ontario Geological Survey

Map 2470

CABOT AND KELVIN TOWNSHIPS

SUDBURY DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

60 40 20 0 1 2 Miles

1000 0 1 2 3 Kilometres

Feet 1000 0 5,000 10,000 Feet

PROPERTIES, MINERAL DEPOSITS

CABOT TOWNSHIP

1. Canadian Johns-Manville Company Limited Prospect
2. Claw Lake Molybdenum Mines Limited Prospect
3. Doyon, P.
4. Falconbridge Nickel Mines Limited
5. Galata Occurrence
6. Irving, M.A., Estate
7. Johnsmith Mines Limited Occurrences
8. Larche, J.P.

KELVIN TOWNSHIP

9. HBOG Mining Limited
10. Talisman Mines Limited [1967]

Information current to December 31st, 1975.

Only former properties on ground now open for staking are shown where exploration information is available — a date in square brackets indicates last year of exploration activity. For further information see report.

Bedding, top unknown; (inclined, vertical).

Bedding, top indicated by arrow; (inclined, vertical, overturned).

Bedding, top (arrow) from grain gradation; (inclined, vertical, overturned).

Bedding, top (arrow) from cross bedding; (inclined, vertical, overturned).

Bedding, top (arrow) from relationship of cleavage and bedding; (inclined, overturned).

Lava flow, top (arrow) from pillows shape and packing. Lava flow, top in direction of arrow.

Direction of paleocurrent.

Schistosity; (horizontal, inclined, vertical).

Gneissosity; (horizontal, inclined, vertical).

Foliation; (horizontal, inclined, vertical).

Banding; (horizontal, inclined, vertical).

Lineation with plunge.

Geological boundary; (observed, position interpreted, deduced from geophysics).

1000? MA — Magnetic contour value in gammas. Magnetic attraction.

Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.

Lineament.

Jointing; (horizontal, inclined, vertical).

Drag folds with plunge.

Anticline, syncline, with plunge.

DH — Drill hole, (vertical, inclined, projected vertically, projected up dip). Overburden shown.

Location of sample.

Vein, vein network. Width in inches or feet.

RA — Radioactivity.

Swamp.

69 — Motor road. Provincial highway number encircled where applicable.

Other road.
Trail, portage, winter road.

International or Provincial boundary.

VI — County, District, Regional or District Municipal Boundary, with mile post.

VI — Municipal Boundary, (City, Town, Improvement District, Incorporated Township), with milepost.

VI — Township, Indian Reserve, Meridian, Base Line, Provincial Park, with milepost, (surveyed, unsurveyed).

2 ① — Mining property, surveyed. Mineral deposit or mining property, unsurveyed.

Surveyed line.
Unsurveyed line.

All boundary and survey lines are approximate position only.

Some symbols may not occur on this map.